Does (De)selection from a Sport Tryout Affect Sports Participation in Emerging Adulthood?

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By

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ABSTRACT

**Background:** The effects of (de)selection from sport have long been overlooked as much of the research surrounding a child athlete’s exit from sport has focused on dropout. One of the potential reasons an athlete drops out of a sport is due to (de)selection. It has been shown that (de)selection can play a role in the sporting path an athlete takes with much of the literature focusing on the negative psychological repercussions. Additionally, the research that does exist focuses on the short-term effects of (de)selection. One study in Saskatchewan (the Saskatchewan Sports Participation Study Baseline Cohort (SSPSBC), 2013-2017) showed that being (de)selected from a provincial sports team tryout did not affect short-term (36-month) sports participation. Within this cohort SSPSBC now entering the critical period of emerging adulthood, this study aimed to recontact the SSPSBC participants and create a SSPS follow-up cohort (SSPSFC) to (i) determine if being (de)selected from a sport team tryout affected long-term sports participation in that try-out sport and (ii) determine if being (de)selected affected long-term sports participation in all sports. **Methods:** Baseline data collection occurred between 2014 and 2015 and included male and female athletes from 6 different sports (soccer, basketball, hockey, baseball, volleyball, and football) across 3 different age groups (U14, U16, and U18). The email address provided at baseline testing was used to contact participants with one primary email sent out followed by 3 follow-up emails. As part of the email, a Sport Participation and Activities (SPA) Survey was sent out via SurveyMonkey and those who responded comprised the SSPSFC. Descriptive statistics and mean differences by ANOVA were calculated. The Chi-Square Goodness of Fit test was used to analyze frequency data. **Results:** 140 participants comprised the SSPSFC (56 females and 84 males), 18% of the original 870 SSPSBC. The
SSPSFC was found to have similar percentages by sport, (de)selection, and sex to the SSPSBC. It was also found that baseline characteristics in the SSPSFC were similar to those observed in the SSPSBC. Deselection at try-out was found to effect long-term sports participation in the try-out sport (p<0.05). However, (de)selection at a tryout did not affect participation in sport per say in emerging adulthood (p>0.05).

**Conclusion:** The results suggest that (de)selection can affect long-term sports participation in the tryout sport, but many athletes still participated in other sports. This suggests that athletes who are deselected may find alternative sporting paths.
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Table of Contents

1.0 Introduction ........................................................................................................................................ 1

2.0 Literature Review............................................................................................................................... 6
   2.1 History of sports participation .......................................................................................................... 6
   2.3 Health Benefits of Sports Participation ............................................................................................ 9
      2.3.1 Physical benefits ....................................................................................................................... 9
      2.3.2 Psychological benefits ............................................................................................................. 12
   2.4 Current Rates of Sports Participation ............................................................................................... 13
      2.5.1 Growth ..................................................................................................................................... 14
      2.5.2 Maturation ............................................................................................................................. 16
      2.5.3 Relative Age .......................................................................................................................... 17
   2.7 Sports Participation in Emerging Adulthood ..................................................................................... 19
   2.8 Exit From Sport ............................................................................................................................... 20
   2.9 Dropout From Sport ....................................................................................................................... 21
   2.10 (De)Selection From Sport ............................................................................................................ 22
   2.12 Summary ....................................................................................................................................... 27

3.0 Methods .............................................................................................................................................. 30
   3.1 Participants ..................................................................................................................................... 31
   3.2 SSPSBC methods ............................................................................................................................ 31
      Biological age ..................................................................................................................................... 32
      Relative Age..................................................................................................................................... 32
   Anthropometry ..................................................................................................................................... 32
   3.3 Survey tools .................................................................................................................................... 33
   3.4 Analysis .......................................................................................................................................... 33

4.0 Results ................................................................................................................................................ 35
   4.2 - Age, Height, Weight, and Maturity by Sport, Sex and Team Selection ............................................ 38
   4.3 - Effects of Team Selection on Long Term Sports Participation ..................................................... 42

5.0 Discussion ........................................................................................................................................... 44
   5.1 Growth, Maturation, and the RAE ................................................................................................. 45
   5.2 Deselection and Exit from Sport ..................................................................................................... 46
5.3 Sports Participation ........................................................................................................... 48
5.4 Limitations .......................................................................................................................... 50
5.5 Future Directions ................................................................................................................ 52
5.6 Conclusion .......................................................................................................................... 53
6.0 References ......................................................................................................................... 55
APPENDIX A: PRIMARY EMAIL OUTREACH ........................................................................ 68
APPENDIX B: SPORTS PARTICIPATION ACTIVITIES QUESTIONNAIRE ..................... 70
APPENDIX C: PARTICIPANT CONSENT ............................................................................. 79
APPENDIX D: ETHICAL APPROVAL .................................................................................... 81
APPENDIX E: FOLLOW-UP STUDY ...................................................................................... 82
List of Tables

Table 2.1 – Percentage of Athletes who Indicated That Tryout Sport Was Main Sport .......... 27
Table 4.1 – Number of Athletes and Percentage of Athletes for SSPSBC and SSPSFC by Sport, Selection at Tryout, and Year of Study ................................................................. 35
Table 4.2 – Number of Athletes for SSPSBC and SSPSFC by Sport, Sex and Year of Study ........ 36
Table 4.3 – Mean Differences Between Selection Groups in SSPSFC Hockey Players ............... 38
Table 4.4 – Mean Differences Between Selection Groups in SSPSFC Soccer Players ................. 39
Table 4.5 – Mean Differences Between Selection Groups in SSPSFC Basketball Players ............. 39
Table 4.6 – Mean Differences Between Selection Groups in SSPSFC Football Players ............... 40
Table 4.7 – Mean Differences Between Selection Groups in SSPSFC Volleyball Players ............ 41
Table 4.8 – Mean Differences Between Selection Groups in SSPSFC Baseball Players ............... 41
Table 4.9 – Athletes Playing the Same Sport at Baseline and Follow-up in SSPSFC by Selection and Sex ............................................................................................................. 42

List of Figures

Figure 2.1 – Growth in height of the son of the Count de Montbeillard, data collected from birth until the age of 18 years, 1759-1777 ........................................................................................................ 15
Figure 3.1 – Saskatchewan Sports Participation Study Timeline .................................................. 30
Figure 4.1 – Birth Month Quartile Distribution by Tryout Success for SSPSFC ............................. 37
Figure 4.2 – Reasons For Dropping Out of Sport by Percentage in SSPSFC .............................. 43
<table>
<thead>
<tr>
<th>Term Used*</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical activity (PA)</strong></td>
<td>Umbrella term that refers to any type of bodily movement produced by skeletal muscles, that results in energy expenditure (Caspersen et al., 1985)</td>
</tr>
<tr>
<td><strong>Exercise</strong></td>
<td>A subset of PA that is planned structured, and repetitive and has a final or intermediate objective (Caspersen et al., 1985)</td>
</tr>
<tr>
<td><strong>Sport</strong></td>
<td>Sport is defined as an activity that requires direct physical competition with an opponent(s), has established procedures and rules, and defined criteria for determining victory (Poliakoff, 1987)</td>
</tr>
<tr>
<td><strong>SSPSBC</strong></td>
<td>Saskatchewan Sports Participation Study Baseline Cohort</td>
</tr>
<tr>
<td><strong>SSPSFC</strong></td>
<td>Saskatchewan Sports Participation Study Follow-up Cohort</td>
</tr>
<tr>
<td><strong>Children</strong></td>
<td>Birth – 18 years of age</td>
</tr>
<tr>
<td><strong>Childhood</strong></td>
<td>Birth – 8 years of age</td>
</tr>
<tr>
<td><strong>Adolescence</strong></td>
<td>8 Years of age – 18 years of age</td>
</tr>
<tr>
<td><strong>Emerging adulthood</strong></td>
<td>18 years of age – 25 years of age</td>
</tr>
<tr>
<td><strong>Early adulthood</strong></td>
<td>Over 25 years of age</td>
</tr>
<tr>
<td><strong>Professional academy</strong></td>
<td>Sporting structure most commonly found in Europe and used in the sport of soccer with the purpose of providing a defined pathway to the professional team within the same organization</td>
</tr>
<tr>
<td><strong>Short-Term Sport Participation</strong></td>
<td>Baseline – 36 months</td>
</tr>
<tr>
<td><strong>Long-Term Sport Participation</strong></td>
<td>Baseline – 84 months</td>
</tr>
</tbody>
</table>

*The definitions used in this table are for clarification purposes specific to this project.
1.0 Introduction

Physical activity (PA) during childhood has long been shown to have a multitude of health benefits, both short and long-term, with children’s PA patterns shown to track into adulthood (Raitakan et al., 1994; Telama et al., 1997, 2006). PA can be broken down into two components: habitual physical activity and exercise. Habitual physical activity consists of bodily movements driven by the skeletal muscles that result in an expenditure of energy (Khan et al., 2012). Exercise, on the other hand, features structured bodily movements with the aim of maintaining or improving physical fitness. Sport is a subset of exercise that can be performed either individually or with a team. Sport can be defined as an activity that requires direct physical competition with an opponent(s), has established procedures and rules, and defined criteria for determining victory (Poliakoff, 1987). Children’s participation in sports has been shown to have strong physical, psychological, and social benefits which continue well into adulthood (Batista et al., 2019; Eime et al., 2013; Kjønniksen et al., 2009; Telama et al., 2006). This suggests that participation in sport during childhood will carry lifelong health benefits. With this in mind, it is important to note that children’s sports participation in Canada has been gradually decreasing. According to the 2022 Canadian ParticipACTION Report Card on Physical Activity for Children and Youth, 57% of 11–15-year-olds participate in organized sport (ParticipACTION, 2022). A significant factor that may influence the decrease in sports participation is team selection which begins as early as age 10 (Blakelock et al., 2016; Neely et al., 2017). What is unknown is how (de)selection impacts longitudinal participation in that sport, and other sports, as an individual passes through adolescence into emerging adulthood. If (de)selection does influence continued sports participation, then (de)selection may impact health in adulthood.
Deselection from school sports in Canada begins largely in grade 9 (13-14 years), as high school teams try to remain competitive (Baxter-Jones et al., 2020a). Children’s sport initiation, and sustained participation, are influenced by a dynamic array of physical and psychosocial factors. A potentially important determinant of sports participation, which has both physical and psychosocial implications, is variation in the tempo and timing of adolescent’s growth and maturation. Within many team sports, an adolescent with greater physical growth and maturity (either because he/she has a birthdate early in the selection year, and thus is older and/or because he/she is more mature for their chronological age) is more likely to be selected for sports teams because of advanced development in size, strength, speed, and endurance related to being older. For example, in a study of Saskatchewan male and female athletes (The Saskatchewan Sports Participation Study (SSPS)), it was found that, in general, athletes at sports try-out were already taller than the general population, in some sports were maturing earlier, and were in general born early in the selection year (Baxter-Jones et al., 2020a). Given the individual differences in psychological adaptation to biological maturation (Alsaker, 1996), it is likely that the impact of physical growth and maturation on long term sport participation is mediated by athlete’s self-perceptions of their physical attributes and sport competence (Cumming et al., 2011). Furthermore, biological maturation and the associated differences in young athletes’ physique can influence coaches' perceptions of an athlete's ability, talent, and potential. These perceptions may affect a coach's behavior towards an athlete, such as their use of guiding instruction and positive reinforcement, which are important in predicting athletes’ intention of continued sport involvement (Sherar et al., 2010). This is important as the coaches' perceptions influence whether an athlete is (de)selected for a team, which may in turn influence the athletes' continued sports participation.
Deselection, also known as cutting, has been shown to influence the sporting path a child athlete chooses to take and can be found at both the recreational and competitive levels (Brown & Potrac, 2009; Gleddie et al., 2019). Deselection can either come from a single tryout or spending a period of time with a team and not making the final roster (Neely, 2022). When discussing why child athletes discontinue sport, it is important to differentiate deselection from dropout. Dropout represents a choice that the athlete makes to discontinue their sport whereas deselection is determined by coaches and other sports administration personnel (Cervelló et al., 2007; Monteiro et al., 2017; Taylor & Ogilvie, 1994). Although limited, much of the recent literature surrounding (de)selection has focused on understanding the psychological and emotional effects an athlete faces after being (de)selected from a team and how it affects their future sport and career pathways (Blakelock et al., 2016; Neely et al., 2017; Williams & MacNamara, 2020). (De)selection is often considered a traumatic event and requires various coping strategies to manage that trauma (Blakelock et al., 2016). Blakelock and colleagues (2016) found that those who adopt a problem-focused coping strategy were more likely to experience lower levels of psychological stress and better transition quality. One of the limitations of the Blakelock et al. (2016) study was that the coping mechanisms of these athletes were examined over a short period of time. Little is known if the chosen coping mechanism helped the athlete long-term (McGlinchey et al., 2022).

One of the key causes of emotional distress can be attributed to the loss of athlete identity with athletes who have a strong exclusive athletic identity often facing the most difficulties (Brown & Potrac, 2009; Grove et al., 2004). It has been found that female hockey and soccer players question their identities following deselection from a provincial team tryout (Neely et al., 2018). The need for longitudinal data to better understand athlete experiences in response to
deselection processes has been well documented. (McGlinchey et al., 2022; Neely et al., 2016, 2018).

With the timeline of deselection most commonly occurring during adolescence, the negative effects of deselection may be amplified, as social circles can be affected (Gleddie et al., 2019). Adolescence has been identified as a critical time during which sports participation is often replaced by social commitments (Crane & Temple, 2015). Adolescence is followed by the next critical growth period of emerging adulthood, typically between 18 and 28 years of age, which has been characterized by decreased physical activity levels and associated long-term increased health risks (Barbour-Tuck et al., 2018).

To investigate the effects of (de)selection on short (36 months) - and long-term (84 months) sport participation, the Saskatchewan Sports Participation Study (SSPS) was initiated in 2013 and funded by Sport Canada and the Social Sciences and Humanity Research Council (SSHRC). The original goals of SSPS were to examine; (i) the effects of growth and maturation on (de)selection onto a youth sports team; and (ii) the effects of (de)selection on short-term (36 months) sports participation. The origins for the study came from the findings of Sherar and colleagues (2007) who found that Saskatchewan male hockey players who were more mature, due to an earlier birth date in a given selection year, had a better chance of being selected for the provincial team (2007). The SSPS advanced these findings by asking the same question but expanding the scope of study to a variety of other provincial-level teams across a broader range of sports; namely: hockey, soccer, basketball, football, baseball, and volleyball. The SSPS found that an over-representation of athletes being selected were born early in the selection year compared to those born later in the year. SSPS also found that the majority of (de)selected athletes were still participating in sport, but not necessarily the try-out sport, 36 months later.
Although (de)selection differences did not seem to affect sports participation in the short term, it was found that early maturing male athletes were more often selected over their later maturing peers (Baxter-Jones et al., 2020).

Building on what is already known, the present thesis aims to address the question(s): (i) does (de)selection from a provincial sports team affect long-term (84-month) sports participation in the try-out sport and (ii) does (de)selection from a provincial sports team affect long-term (84-month) sports participation in all sports. It was hypothesized that athletes who were (de)selected during youth team tryouts would not be participating in that tryout sport during emerging adulthood. It was further hypothesized that being deselected for a team sport would affect continued participation in any sport.
2.0 Literature Review

2.1 History of sports participation

Participation in sports has a long, complex history with many theories and perspectives relating its origins to hunting and warfare (Lombardo, 2012; Mewett, 2002). Sport can be defined as an activity that requires direct physical competition with an opponent(s), has established procedures and rules, and defined criteria for determining victory (Poliakoff, 1987). Although it is difficult to determine when sport began, the ancient Greek culture supported some of the most well-known organized sporting competitions in the world (Craig, 2002; Pope & Guttman, 1993; Strenk, 1979). These athletic festivals were known as the Olympic, Pythian, Nemean and Isthmian Games. These incredible celebrations of athleticism were held regularly until 349 AD. Children as young as 12 years old were permitted to compete alongside fully grown adults if they were considered physically able to do so; the first recorded use of maturation as a determinant of participation. The Olympics would later adopt both an age category for boys and an age category for men with the latter category reserved for those above the age of 18 (Faculty of Arts – Department of Ancient History, 2012). Women were first documented participating in sport in the Herean games in approximately 1000 BC (O’Brien & Robertson, 2010). However, it wasn’t until the mid-20th century that women began to realize equal opportunities in sports across both youth and senior sporting organizations (Gregg & Gregg, 2017).

During the mid to late 1800s, organized sports across North America rose to popularity as the industrial world developed (Rader, 1977; Riess, 1990). Modern-day sports as we know them can be traced to 3 geographical regions, America, Europe, and Asia (Donnelly, 2011; Lee &
Kim, 2016). The types of sports played in different parts of the world were largely tied to the cultural and societal tendencies of these subcommunities (Lee & Kim, 2016).

2.2 History of youth sport

Although adult sport has a long and well-documented history across the globe, organized children’s sporting competitions are a relatively new concept in comparison to adult sport. Children’s sports can be divided into two categories: informal (unorganized) and formal (organized) sports. The difference between unorganized and organized sports can be differentiated by the amount of involvement from an adult figure, such as a coach or parent (Leichter-Saxby, 2016; Malina, 2016). In the context of unorganized sports, youth are in complete control of decisions such as the duration of the activity, the teams, and the rules of the game. Adults are present for the sole purpose of ensuring the safety of the youth who are playing the games (Barreiro & Howard, 2017). Many unorganized sports mimic those of structured sports and include variations, or small-sided versions, of the sport played in different environments (Malina, 2016). Organized sports are very common in North America and include soccer, basketball, football, and baseball. Organized sport is characterized by being adult-run with much of the decision-making in place prior to participation (Barreiro & Howard, 2017; Malina, 2016).

The history of children’s sports programming varies from country to country. The birth of organized sports is often credited to private organizations rather than government institutions (Wiggins, 2013). In the USA, the birth of organized sports programs came from two significant developments (the elimination of child labour and compulsory attendance of school) that were a consequence of the Industrial Revolution in the late 19th century (Malina, 2016). These two developments were created because of concerns for the behaviour of boys (girls’ behaviour was
not addressed) and the importance of keeping children active during their spare time in the growing cities. According to Wiggins (2013), the idea of *Muscular Christianity* was largely responsible for the inception of organized youth sports in the United States. *Muscular Christianity* was adopted by American protestants who advocated the Greek ideologies of developing the mind, body, and spirit, which they believed could be achieved through playing sports (Lewis, 1966). The most well-known organization, the Young Men’s Christian Association (YMCA) was a driving force in promoting *Muscular Christianity* through youth sports programs, (Putney, 2001). In 1903, in New York City, the movement of organized youth sports led by Luther Gulick gave birth to the Public-School Athletic League (PSAL) (Jable, 1979). This youth sports program was the first of its kind and allowed schools to have a platform to formally compete against each other. The creation of this formalized league provided sports programs with the foundation to uncover the benefits of enrolling youth in organized sports programs.

Subsequently, most organized sports programs were formed in the 1920s and 1930s, with additional community-based agencies and churches recognizing the multitude of benefits that sports can have on the upbringing of a child (Malina, 2016; Wiggins, 2013). In the USA, football and baseball were the first sports to have recognized and organized youth programming. An example came in 1939 when little league baseball was founded by Carl Stotz (Malina, 2016). Popular agency-sponsored programs such as Pop Warner Football, The Police Athletic League Track club, and YMCA Soccer were founded shortly thereafter. With the inception of these various programs, children’s sports began its’ rise to prominence all over the USA (2016). US little league baseball was first chartered in 1951, with most of the games taking place on both the eastern and western coasts of the USA (*About/History*, n.d.).
While the history of children’s sports north of the border is not as well documented (Malina, 2016; Trussell & McTeer, 2007), Canada followed the post-war trend in trying to solidify sport and recreation as a public policy by issuing the Fitness and Amateur Sports Act in 1961 (Harvey et al., 2013). However, Canada chose to focus this act primarily on the high-performance success of hockey on the international stage as opposed to national sports participation efforts. Nevertheless, one of the most prominent movements in children’s sport in Canada was initiation of Canada Games in 1967 and its’ rotation between winter and summer games in 4-year cycles (Smith, 2008). Participants between the ages of 12 and 18 represent their province or territory in this multi-sport event that was founded to promote national unity through sport.

Today, children’s sports programs across North America follow a similar structure (Malina, 2016). Most of both recreational and school-based sports systems are publicly funded, with academies and sport-specific clubs comprising the rest of the organized sport ecosystem. These publicly funded sports federations include both national and provincial/state-run governing bodies.

2.3 *Health Benefits of Sports Participation*

2.3.1 Physical benefits

The positive long-term health effects of physical activity in childhood are well documented with those engaging in regular physical activity shown to have reduced predisposition to several chronic adult diseases, including cardiovascular-related diseases (Reiner et al., 2013). Physical activity (PA) can be broken down into two components: habitual physical activity and exercise (ref?). However, it is important to consider that exercise can come in many forms, one of them being sports participation. Participation in organized youth sports is one of
the most popular forms of physical activity and a potential contributor to the development of lifelong physical activity habits (Kjønniksen et al., 2009; Tammelin et al., 2003). In relation to these lifelong habits, sports participation in youth has a multitude of benefits in adulthood including increased cardiovascular fitness, bone health, and motor skill development (Lagestad & Mehus, 2018; Lloyd et al., 2014; Martin et al., 2021; Mazzag et al., 2018; Metcalf et al., 2020).

The spectrum of sports involvement from recreational to elite competition is vast. In 1994, the United Kingdom initiated the Training of Youth Athletes (TOYA) study to investigate the effects of intensive youth training in a variety of sports. Specifically, the study was initiated to address concerns that training for sports at a young age could be harmful to a child’s development (Baxter-Jones & Helms, 1996). The study found that athletes who participated in endurance sports such as soccer, swimming, and tennis had much higher levels of aerobic and muscular power (attributes beneficial to health and wellbeing) than athletes who participated in sports like gymnastics. The TOYA study showed that improvements in strength were independently impacted by training. This is important as the effects of growth and maturation across the growing years can mask or be greater than the effects of training. In other words, those who are considered early maturers will still have a significant advantage over late maturing athletes even if those late maturing athletes are training more. These findings were further supported by other longitudinal studies. For example, Lagestad and Mehus (2018) tracked the peak VO\(_2\) of Norwegian athletes from 14 to 19 years of age. Peak VO\(_2\) was defined as the highest rate of oxygen that can be consumed during exercise and is the gold standard for measuring aerobic fitness in children (Lagestad & Mehus, 2018; Rowland, 1993). Measuring peak VO\(_2\) has been used to determine cardiorespiratory fitness which has an inverse relationship with
cardiovascular risk factors (Anderssen et al., 2007). This Norwegian study found that adolescents who continued their participation in sport maintained higher levels of cardiorespiratory fitness at both 14 and 19 years of age (Lagestad & Mehus, 2018). In a study of Saskatchewan adolescents, those who had low adolescent peak VO$_2$ had lower values in middle age (40-50 years) relative to adult groups who had average and high peak VO$_2$ in middle age (Van Oort et al. 2013). These results suggest that participation in sports can not only provide short-term fitness benefits but that these benefits can provide a long-term protective effect against adult diseases such as cardiovascular disease.

Additionally, the importance of childhood participation in sport and how it affects physical activity later in life has been established across several studies in Scandinavia (Palomäki et al., 2018; Telama et al., 2006). In general, it has been shown that 1) higher frequencies of sport participation in youth are associated with higher levels of PA in adulthood; and 2) frequencies of as little as once per week have been related to having a positive influence on adulthood physical activity levels (Tammelin et al., 2003; Telama et al., 2006). In fact, a study performed by Telama and colleagues, from a sample of 2,309 Cardiovascular Risk On Young Finns Study participants, showed that children who participated at the highest sporting levels were 2 to 13 times more likely to engage in high levels of PA during adulthood (2006). The results of this study are consistent with a systematic review that looked to verify the association between participating in sports in childhood and adolescence and physical activity in adulthood. The review found that the highest number of practices and the highest level of competition were positively associated with physical activity later in life (Batista et al., 2019). In other words, keeping children not only participating in sports but competing at an elite or competitive level may improve their physical activity levels later in life.
2.3.2 Psychological benefits

Although the physical benefits are well documented, participation in sports has also been shown to have a multitude of psychosocial benefits (Steiner et al., 2000). In 2009, Dodge and Lambert studied 8,152 participants from the American National Longitudinal Study of Health Research and examined the relationship between participating in sports during adolescence and physical activity and subjective wellbeing in emerging adulthood through a series of self-reported surveys over the course of 3 data collection periods. They found that participating in sport was positively associated with subjective well-being, whilst controlling for general physical activities such as jogging, walking, biking, etc. (Dodge & Lambert, 2009). More recently, the benefits of how participating in sports can have a positive effect in the social domain were examined (Bedard et al., 2020). According to Bedard and colleagues (2020), sports participation is positively associated with perceived social competence in youth regardless of the level of sport they play. This is significant as perceived social support has been shown to have a positive impact on social skills and the quality of relationships in everyday life (Grisset & Norvell, 1992).

While the psychosocial benefits of participating in sports have been well established, team sports in particular have been shown to have greater psychosocial benefits than individual sports (Kudlacek, 2021). A study performed with youth from Slovakia and the Czech Republic compared the differences between participating in team and individual sports and found that there was a significant association between team sport participation and frequency of physical activity per week (Kudlacek, 2021). The study reported that youth who participated in team sports were 2.5 times more likely to be more physically active than those who participated in individual sports. This suggests that the social impact of playing organized sports may be amplified in a team-based setting. These results are supported by a systematic review of psychological and social benefits of participating in sports (Eime et al., 2013). Eime et al. (2013)
found that sports participation had greater benefits on psychological and social health than other forms of leisure-time physical activity. Eime and colleagues (2013) concluded that the social nature of playing organized team sports can enhance the existing health benefits of sports participation. Specifically, belonging to an organization or team could potentially be one of the most important benefits of sports participation. These results suggest that terminating an athlete's involvement in a team setting may produce more negative consequences than the simple cessation of physical activity. However, limited research has been done using athletes from individual sports.

2.4 Current Rates of Sports Participation

While trends for sports participation across childhood and adolescence vary from country to country, there is a lack of global data as most of the attention has centred around physical activity and inactivity (Malina, 2016). In Canada, over 74% of youth ages 5 to 19 participated in organized sport prior to the onset of COVID-19 and 63% participated during the pandemic (ParticipACTION, 2022). Similar trends were seen in the USA concerning how the pandemic impacted sports participation (Participation Trends, 2022). In 2022, the Aspen Institute reported that children were playing sports at a historically low rate with only 37% of children ages 6-12 playing team sports. The report stated that, prior to the pandemic, 45% of youth ages 6-12 were actively playing sports. In other words, participation in sports saw a national decline as programs struggled to provide COVID-19 safe opportunities that aligned with the geographical and facilities-related (?) restrictions.

Although these numbers were impacted by the lack of organized sports opportunities, the Aspen Institute also stated that the effects of pandemic restrictions were not as severe on the older age groups. The report found that there was a slight increase in sports participation for
youth ages 13-17 during the pandemic(?), which suggests that school-based programs and elite traveling teams were not heavily impacted (*Participation Trends*, 2022).

### 2.5 The Role of Growth and Maturation on Team (De)Selection

As previously indicated, a child’s birth date and timing of their maturity have a significant influence on their size and performance during adolescence, and ultimately (de)selection onto a team. It is therefore imperative that individuals working with youth sport understand how a child grows, matures, and develops.

#### 2.5.1 Growth

The term growth refers to the increase in size and changes in body composition that an individual will experience as they age chronologically (Malina et al., 2004). Growth can be measured by both the rate (tempo) and the distance (timing). The rate of growth can be seen as how quickly size is increasing and is found by dividing size by time. Distance is seen as the absolute size at any point in time and is determined through the accumulation of all preceding growth. Distance is found by taking a measurement at a single timepoint. In order to calculate the growth rate over time (tempo), longitudinal data is typically required (Malina et al., 2004). One of the earliest examples of longitudinal growth data belonged to Count De Montbelliard who tracked his son's growth every few months from birth until 18 years of age. A simulation of Count De Montbelliard's Son's growth is shown both as a distance curve and as a velocity curve in the figure below.
Figure 2.1: Growth in height of the son of Count de Montbeillard, data collected from birth until the age of 18 years, 1759-1777 (Tanner, 1962) (Retrieved from http://ejo.oxfordjournals.org/content/30/5/449/F7.expansion)

All healthy children follow the same pattern and sequence of growth spurts that resemble the above figures. However, the timing and tempo at which children reach these milestones varies (Tanner, 1990). As shown in the above Figure 2.1 the first few years of childhood are the most rapid period of postnatal growth. By age 4 or 5, the rate of growth slows from 20 cm/yr to about 5-7 cm/yr. This rate of 5-7 cm/yr stays fairly constant until the onset of puberty which happens at about the age of 10 for girls and the age of 12 for boys. During adolescence, average peak growth rates reach 9 cm/yr for girls and 10.3 cm/yr for boys (Tanner, 1990). The age at which a child obtains this peak growth rate in adolescence is known as the adolescent or pubertal growth spurt, indexed by peak height velocity (PHV) (growth in cm per year). On average, PHV occurs at around age 12 for girls and age 14 for boys. The age at which you reach peak height velocity is considered a maturational milestone with the time at which this occurs due in great part to genetic differences (Baxter-Jones et al., 2005). Due to the variation between individual growth patterns and the time at which PHV is achieved, selecting children based on their physical characteristics can become problematic (Baxter-Jones et al., 1995; Malina et al., 2019).
2.5.2 Maturation

Maturation refers to the body’s physical, sexual, and somatic progression toward the adult state (Malina et al., 2004). While growth curves and patterns of growth are generally the same across individuals, as previously indicated the chronological age at which different stages of maturity are reached can vary (Malina et al., 2004). An individual's biological age (BA) is commonly used to refer to an individual's progression toward the physically mature state (Baxter-Jones & Helms, 1996; Malina et al., 2004). This is different from chronological age (CA) which refers to the calendar age in years and months since a child was born. It is important to understand that children at the same CA are not always at the same BA. This can become an issue in sports historically as sports teams are divided based on CA (Malina et al., 2019). It is recommended that between the ages of 6 and 16 that children be classified into three groups around the mean of a maturaty measure, as follows: early + 1.0 SD above the mean; average between -0.5 and +0.5 SD; late -1.0 SD below the mean (Beunen, G. 1989). When selecting players for these CA-based teams and programs, athletes who are deemed “early maturers”, also known as having an advanced BA for their age group, can be at a significant advantage (Baxter-Jones, 1995; Baxter-Jones et al., 2020; Malina et al., 2019). Advanced BA has been shown to play a significant role in the selection of an athlete onto a sports team with boys defined as later maturing being excluded as early as 12 years of age (Malina et al., 2017). With success across many sports being heavily influenced by physical characteristics, athletes deemed to have an advanced BA have a significant performance advantage within their respective sport (Baxter-Jones et al., 1995). Physical characteristics such as speed, strength, and power are often highly desired across many sports and heavily favor those with an advanced BA (Malina et al., 2004, 2015; Till et al., 2017). Furthermore, advanced BA has been shown to positively influence psychological constructs related to perceptions of physical competence and technical skill.
development (Cumming et al., 2018; Guimarães et al., 2019). These findings highlight the fact that those individuals who are not at an advanced BA are at a disadvantage when placed in a tryout situation where being selected or deselected is at stake.

2.5.3 Relative Age

Relative age describes the distribution of age within age bands; chronological age bands are traditionally used in youth sport, e.g., U10, U12, U14 etc. The consequences of the age difference between individuals born in the same age band on various outcomes is known as the relative age effect (RAE) (Musch & Grondin, 2001). The concept of the RAE was first described in the public school system where it was observed that typical chronological age groupings of one year, split up into grades, was associated with significant variation in cognitive development between individuals (Musch & Grondin, 2001). For example, a frequently used birth date cut-off date in developmental soccer is January 1st. This results in a difference of eleven months in Relative Age (RA) between two players, one born in January and the other December. The Relative Age Effect (RAE) indicates that children born just before January 1st face the disadvantage of being placed in a team with older players. Consequently, a player born in January will have a nearly one-year growth advantage over their teammates born in December.

This advantage becomes most prominent during adolescence when children of the same CA can have up to a 5 years difference in biological age among their peers (Malina et al., 2019; Rogol et al., 2018). Implications of the RAE have been found across a variety of sports such as soccer, basketball, baseball, and hockey (Beals et al., 2018; Figueiredo et al., 2019; Fumarco et al., 2017). The effects of the RAE have even been found at the professional level as highlighted by Barnsley and Thompson (1988) who found that adolescent and professional ice hockey
players had birthdays that were heavily skewed towards the first few months of the year (Barnsley & Thompson, 1988).

2.6 Sport (De) Selection During Adolescence

When addressing maturation and relative age effects on team selection, soccer and basketball have been the two sports that have yielded the most citations (Arede et al., 2019; Malina et al., 2017). In a recent review completed on soccer players, it was found that the average height and weight of soccer players had increased over the years 1978 to 2015 (Malina et al., 2017). While researchers have indicated that this physical change could be due to improved nutrition and health status of youth athletes, the more likely explanation is that there is a systemic selection bias that begins at about 12-13 years of age where those who are more mature are more likely to be selected (Malina et al., 2017). These conclusions are supported by a study of basketball players which found that those selected were taller, had greater fat-free mass, strength, power, and were more technically advanced (Guimarães et al., 2019); all attributes associated with advanced maturity status. These results show that more mature players not only had a physical advantage but, in some cases, had a higher level of technical skill. This in turn would give those who are classified as “early maturers” a significant performance advantage over their “average and late maturer” peers.

Children classified as early maturers have long been at an advantage given that our sports systems have a history of selecting teams according to chronological age (CA) bands of either 12 or 24 months (Baxter-Jones et al., 1995; Rogol et al., 2018). An example is that an under 13 team would consist of both 11- and 12-year-olds. The current grouping method assumes that adolescents of a similar age will be of similar size and ability (Malina et al., 2019).
These maturational advantages have also been found in Saskatchewan youth athletes. (Baxter-Jones et al., 2020a). The Saskatchewan Sports Participation Study aimed to identify if there were differences in the birth month and growth and maturity factors between boys and girls who are either selected or deselected for a provincial sports team. It was found that selection due to maturational differences were more prevalent in male sports and were sport-specific. The results of the study highlighted that male athletes who tried out for basketball, hockey, football, volleyball, and baseball and were selected were taller than the reference height for their age (Baxter-Jones et al., 2020b). A limitation of the study was that prediction equations were used to estimate maturation rather than direct observation of longitudinal development (Khamis & Roche, 1994; Tanner et al., 1970). If the data were to be re-collected at the present date, a prediction equation would not be necessary as the original participants would have passed PHV.

With sports participation playing a significant role in the overall daily physical activity of an individual, a decrease in sports participation may result in a reduction to the benefits that vigorous physical activity has on both physical and mental health. The benefits of participation in sports in youth have been associated with positive psychological and mental well-being as one enters emerging adulthood (Appelqvist-Schmidlechner et al., 2018; DeFreese et al., 2022). In other words, cessation of sports participation during adolescence by either personal choice or the decision of a coach has the potential to negatively affect an individual's mental well-being. This highlights the importance of allowing individuals the choice of whether they wish to continue in sports during adolescence as opposed to having that choice made for them.

2.7 Sports Participation in Emerging Adulthood

The period of emerging adulthood has been shown to be a key period of development and is characterized by changes in substance use, development of emotional intelligence, and weight
gain (specifically increases in fat mass) (Barbour-Tuck et al., 2018; Dave et al., 2021; Pinquart & Borgolte, 2022) This key period, typically between 18 and 25 years of age, is distinguished by relative independence and a bridging period between adolescence and adulthood (Arnett, 2000). Recently, it has been shown that the physical changes that an individual may experience during this time are largely influenced by lifestyle changes (Barbour-Tuck et al., 2018; Pinquart & Borgolte, 2022). One of the more significant lifestyle changes characteristic to during emerging adulthood is an overall decrease in physical activity levels and concomitant increased health risks (Barbour-Tuck et al., 2018). This decrease in physical activity has been shown to affect the sports participation of individuals entering emerging adulthood (Lagestad, 2019). This can be problematic as shown by an 8-year longitudinal study done by the University of Iowa (Metcalf et al., 2020). The study looked at the influence of vigorous physical activity (VPA) on bone strength and found that VPA can affect loading on the bone into puberty. Given the influence that sports participation can have on vigorous physical activity, it is important to highlight that the continuation of sports may have a positive influence on overall health measures (R. Eime et al., 2015; Sprengeler et al., 2019).

2.8 Exit From Sport

It has been shown that athletes who leave sport both voluntarily and involuntarily can experience a stressful transition period (Russell et al., 2018). Following the termination of sport participation, athletes often report difficulties with eating disorders, depression, and confusion (Cecić Erpić et al., 2004; Crane & Temple, 2015). Loss of identity, use of poor coping mechanisms, and psychological disturbances have also been identified as potential consequences of discontinuing sport (G. Brown & Potrac, 2009; Grove et al., 2004). Exiting a sport can be quite significant at the elite level as there can be both career and social implications (Knights et
al., 2016; Lavallee & Wylleman, 2000; Russell et al., 2018). It’s been suggested that the quality of the athletic transition can directly affect the next steps an athlete takes in their lives (Lavallee & Wylleman, 2000; Stambulova et al., 2007). Athletes with a plan or alternative opportunities to continue playing at a lower level typically have a more positive outlook on voluntary or involuntary termination from a team (Agnew et al., 2018; Stambulova et al., 2007; Taylor & Ogilvie, 1994; Williams & MacNamara, 2020). In fact, even being deselected from a team can have positive implications provided the athlete has athletic and career options to regulate to (Agnew et al., 2018; Neely, 2022; Williams & MacNamara, 2020). Since transition out of sport is a common theme in today's literature, one must understand the difference between voluntarily dropping out of a sport and involuntarily being deselected or released from a sport.

2.9 Dropout From Sport

In recent years, the literature surrounding how an athlete exits a sport has been heavily focused on the effects of dropout. Dropout can be defined as an athlete choosing to terminate their athletic career prematurely before reaching their full potential (Crane & Temple, 2015; Monteiro et al., 2017), and has been identified as a global problem (Battaglia et al., 2022). According to a longitudinal study in Australia, the highest rate of dropout occurs between the ages of 10 and 14, with up to 33% of youth terminating sports participation during this age band (Vella et al., 2016). This age band has previously been highlighted as a key period for both social and physical development across both sexes (Baxter-Jones et al., 1995; Malina, 1994; Rogol et al., 2018). In 2017, a meta-analysis done among youth from Canada and the USA looked to identify the reasons why children dropped out of sport as they approached these transition years (Monteiro et al., 2017). Some of the reasons included conflicts with coaches/trainers, other
things to do, failure, pressure from parents, lack of enjoyment, and boredom. These results highlight the influence of both parents and coaches on the athletes' experience with sport.

Furthermore, the aforementioned reasons for sport dropout during adolescence such as failure, pressure, and lack of enjoyment, appear to remain consistent into emerging adulthood (Sáez et al., 2021). Simultaneously, the many lifestyle changes during emerging adulthood such as moving away from home for the first time, entering university and competing social commitments, appear to compromise opportunities to engage in sports leisurely during this period (Clark et al., 2015; García Puello et al., 2015; Huaman-Carhuas & Bolaños-Sotomayor, 2020). Taken together, the interaction of lifestyle changes and influences from coaches and parents can significantly affect an athlete's decision to continue playing sports into emerging adulthood (Ferreira & Armstrong, 2002; Garity & Murray, 2011). Coach-athlete relationships have been shown to influence the athletes' experience with sports on a multitude of levels (Garity & Murray, 2011; Kim et al., 2014; Monteiro et al., 2017). With coaching dynamics identified as a key factor in the decision of athletes to drop out of sport (Ferreira & Armstrong, 2002; Monteiro et al., 2017; Sáez et al., 2021), attention has been increasingly turned to how coaching decisions can influence an athletes termination of sport (McGlinchey et al., 2022; Milne & Neely, 2022; Williams & MacNamara, 2020). In other words, coaches are often in a position to influence the involuntary termination or deselect an athlete from a sports team.

2.10 (De)Selection From Sport

As previously mentioned, deselection can be seen as involuntary termination from a team due to the decision of an administrator or coach (Blakelock et al., 2016; G. Brown & Potrac, 2009; Taylor & Ogilvie, 1994). Deselection, also known as cutting, can come from not making the roster after a single tryout or after spending a longer “trial” period with a team (Neely, 2022).
It is often considered non-normative, or in other words, can be difficult to predict and potentially lead to complete discontinuation from sport (Petitpas, 2009). Deselection has been shown to affect athletes at all levels of sport with negative effects ranging from psychological distress to complete termination of sports participation (Gleddie et al., 2019; McGlinchey et al., 2022; Williams & MacNamara, 2020). For example, Blakelock et al. (2016) examined the potential psychological distress of elite youth soccer players who were deselected from professional academies. They examined the athletes over 3 timepoints: 7-14 days before deselection, 7 days after, and 21 days after, and found that deselected players experienced higher levels of psychological distress at both the 7th and 21st day than those players who were retained. Furthermore, the severity of psychological distress was often at levels that would require professional mental health support (Rai et al., 2012). In other words, psychological distress was not improving at 3 weeks post-deselection. It was, in fact, reaching concerning levels requiring deployment of outside coping mechanisms by the athletes.

Coping can be described as a conscious attempt to manage a situation perceived to be stressful (Nicholls & Polman, 2007). In the context of sport, 3 main coping mechanisms have been identified: problem-focused coping, emotion-focused coping, and avoidance-focused coping (Carver & Connor-Smith, 2010). Problem-focused coping is directly aimed at the stressor and aims to remove or evade it (Carver & Connor-Smith, 2010). For example, if a player gets deselected from a team, a problem-focused coping strategy to dealing with this stressor would be to continue training and try out again the next year for the same or a different team. Emotion-focused coping aims to minimize the emotional distress associated with the stressor. In the context of getting deselected from a team, an emotion-focused coping strategy would be to seek out counseling to help with emotional support. The final coping mechanism, avoidance-focused
coping, is comprised of attempts to disassociate or escape from the situation (Carver & Connor-Smith, 2010). An example of an avoidance coping strategy in the context of being deselected would be acting as though the deselection did not actually happen. Athletes who use a problem focused-coping strategy were more likely to experience lower levels of psychological distress and higher transition quality (Blakelock et al., 2016; C. J. Brown et al., 2018; Neely, 2022). These findings highlight the importance of transparency and support during periods where deselection may take place (Gleddie et al., 2019).

With the use of poor coping mechanisms shown to promote poor transition quality, a key factor that determines the use of a problem-focused coping strategy is athletic identity (G. Brown & Potrac, 2009). Athletic identity influences transition quality with athletes of strong athletic identity often experiencing the most difficult transition (C. J. Brown et al., 2018; Cecić Erpič et al., 2004; Grove et al., 2004). In other words, athletes who associate their entire personalities with their sport can suffer extreme emotional distress when they are deselected. Athletes with strong exclusive athletic identities have been shown to question their identities as well as exhibit feelings of being lost, confused, and depressed (Brewer et al., n.d.; Grove et al., 2004; Neely et al., 2018; Russell et al., 2018).

Choosing to return to sport has been shown to be related to having strong social support (Neely et al., 2017). Friends and family play an important role in a young athlete's career and can often share some of the emotional distress experienced by the deselected athlete (Ferreira & Armstrong, 2002; Neely et al., 2017). In a study performed by Neely et al (2017), it was found that parents of deselected athletes engaged in a communal coping perspective. Specifically, parents would often share the responsibility of the initial shock of deselection and help their child move to a problem-focused coping strategy. These findings were supported by a study done
by Milne & Neely (2022) which found that having a strong network of support can promote the use of a positive mindset and re-motivate athletes to return to their sport (Milne & Neely, 2022).

Parents can help athletes rationalize why the deselection occurred and help their child reframe the experience to be positive (Neely, 2022; Neely et al., 2018). Positive reframing of deselection can help athletes gain new perspective and motivate athletes to work harder (Neely, 2022; Neely et al., 2018). This implies that, given the correct social and emotional support, being deselected from a sports team can be an important step in helping athletes grow in their athletic careers.

Using the traumatic event of being deselected as an opportunity to grow has been termed post-traumatic growth (Neely et al., 2018). Post-traumatic growth is a positive psychological change that stems from a challenging life experience (Tedeschi & Calhoun, 2004). In the context of sport, Neely et al (2018) found that being deselected from a provincial team can lead to positive growth through enhanced feelings of personal strength, development of closer social relationships, and recognition of alternative opportunities both in sport and occupationally (Agnew et al., 2018; Neely et al., 2018; Williams & MacNamara, 2020). At the elite levels of sport, deselection can often be seen as an opportunity to explore other career paths (Williams & MacNamara, 2020). For example, William & MacNamara (2020) conducted a qualitative study that looked at how deselection affected rugby and cricket players who were cut from professional academies. They found that athletes who were cut acknowledged this traumatic event as a way to build psychological resilience that could be carried over to alternative professional careers away from sport. Furthermore, deselection can be seen as a time to reflect and assess skills that may be useful when entering the workforce. This being said, it is unknown if being deselected in adolescence can determine the sporting and career pathways that are chosen as an athlete enters emerging adulthood.
2.11 Saskatchewan Team Selection Research

In recent years sport selection-based research in Saskatchewan youth has gained much interest. Sulz, Humbert, and Gleddie (2019) worked with athletic directors and teacher coaches across Saskatchewan and Alberta to help gain a better understanding of how deselection was taking place within high schools. Among the reasons given by athletic directors for deselecting student-athletes, 71% stated that there were not enough coaches at their school. The second most common reason was that coaches wanted to keep their team competitive (59%). When it came to the number of children getting deselected only 16% of teacher coaches and athletic directors reported not having to cut any kids at all. Given the prevalence of deselection at the high school level, it is cause for concern that only 13% of schools had guidelines in place for properly deselecting kids. With high school sports often being considered one of the most accessible forms of sport, it is imperative that further research is conducted in order to inform policy around deselection best practice (Gleddie et al., 2019).

Some of the deselection challenges in Saskatchewan have been highlighted in a paper which looked at provincial team tryouts using the baseline cohort of the Saskatchewan Sports Participation Study (SSPSBC) (Baxter-Jones et al., 2020). As previously discussed, the SSPSBC data was used to look at the effects of deselection on short-term (36-months) participation of provincial team athletes. Athletes filled out the 32-question Sports Participation Activity (SPA) questionnaire at baseline testing at the initial tryout and then again at the 36-month follow-up data. The SPA survey asked athletes to list both their primary, secondary, and tertiary sport at tryout and how many days per week they participated in them and at what level. At the 36-month mark, follow-up data was obtained through mail and email with 28% of the original sample responding. The follow-up findings indicated dropout from sport was low, with only 4% of
deselected athletes dropping out of sport completely. However, as shown in Table 2.1, there was a general decline in the percentage of athletes still involved in that sport between baseline and follow-up data collection periods. All the respective sports excluding football saw a decline in the percentage of players who were deselected at tryout and still participating in that sport at the 36-month mark. Although these trends were not found to be statistically significant at 36 months, recollection of the data on long-term rather than short-term is required.

Table 2.1: Percentage of Athlete Who Indicated That Tryout Sport Was Main Sport at 36 Months

<table>
<thead>
<tr>
<th>Sport</th>
<th>Selected Baseline</th>
<th>Selected 36 Months</th>
<th>Deselected Baseline</th>
<th>Deselected 36 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hockey</td>
<td>89%</td>
<td>86%</td>
<td>85%</td>
<td>79%</td>
</tr>
<tr>
<td>Soccer</td>
<td>84%</td>
<td>96%</td>
<td>88%</td>
<td>79%</td>
</tr>
<tr>
<td>Basketball</td>
<td>83%</td>
<td>100%</td>
<td>76%</td>
<td>75%</td>
</tr>
<tr>
<td>Football</td>
<td>51%</td>
<td>57%</td>
<td>31%</td>
<td>56%</td>
</tr>
<tr>
<td>Volleyball</td>
<td>75%</td>
<td>90%</td>
<td>84%</td>
<td>71%</td>
</tr>
<tr>
<td>Baseball</td>
<td>89%</td>
<td>33%</td>
<td>78%</td>
<td>13%</td>
</tr>
</tbody>
</table>

The objective of SPSSBC was not to establish a cause-and-effect relationship (that athlete attrition is entirely due to being (de)selected), but rather to conduct a preliminary investigation aimed at discovering physical growth and maturation and team selection factors that could impact an athlete's ongoing participation in sports and physical activities.

2.12 Summary

In summary, participating in physical activity is beneficial for health both during adolescence and emerging adulthood. A key component of physical activity is sport which has shown to have a multitude of both physical and psychosocial benefits that have been tracked well into adulthood. However, not all children continue to participate in sports. Some choose to leave
(drop out) and some are involuntarily excluded (deselection). Given the well-documented benefits of sports participation, dropping out of sport is of interest. Furthermore, (de)selecting children from competitive sports teams has the potential to not only negatively impact opportunities to be physically active, but also influence the desire to seek out future sporting activities. The literature has shown that (de)selecting children during a tryout period does not significantly affect short-term sports participation. However, it is unknown what the effects of being deselected are, if any, on long-term sports participation.
2.13 Study Aims

The purpose of this study is to examine if being (de)selected from a sports tryout in adolescence affects sports participation in the try-out sport, and other sports, in emerging adulthood. Although the importance of understanding the effects of psychological distress as a result of (de)selection is important, this will not be covered in this thesis. With the period of emerging adulthood being a critical time that is characterized by decreases in sports participation and overall physical activity, the effects of deslection on sport participation will be the emphasis.

The present thesis aims to address the following questions: (i) does (de)selection from a provincial sports team affect long-term (84-month) sports participation in the that try-out sport and (ii) does (de)selection from a provincial sports team affect long-term (84-month) sports participation in all sport. It is hypothesized that (de)selection will result in a decrease in long-term sports participation in the tryout sport. In addition, it is hypothesized that (de)selection would affect continued participation in all sports.
3.0 Methods

The Saskatchewan Sports Participation Study (SSPS) was initiated in 2013 and baseline data (SSPSBC) was collected from 2014 through 2017 (see Figure 3.1). In collaboration with Sask Sport, the following six provincial sport governing bodies agreed to participate in the study: Sask Volleyball (https://www.saskvolleyball.ca/), Football Saskatchewan (https://www.footballsaskatchewan.ca/), Saskatchewan Soccer Association (https://www.sasksoccer.com/), Baseball Sask (https://www.baseballsask.ca/), Basketball Saskatchewan (https://www.basketballsask.com/), Saskatchewan Hockey Association (https://hockeysask.ca/).

Figure 3.1: Saskatchewan Sports Participation Study Timeline

At study initiation child athletes from under-12, under-14, under-16, and under-18 age groups attending provincial team tryouts were recruited. In 2017 all participants in the SSPSBC baseline cohort were recontacted and invited to complete a 36-month follow-up survey. This included all participants who took part in the under-12, under-14, under-16, and under-18 selection tryouts. This phase of data collection utilized an online (REDCAP), over-the-phone, and email-based approach to collecting the survey results (Baxter=Jones et al. 2020). In 2023 ethical approval was received to recontact SSPSBC participants (Appendix D) and a further follow-up survey was hosted via a third-party survey platform, SurveyMonkey (Appendix B). All questions from the original survey were copied verbatim to ensure academic rigor. The
primary means of contacting participants was done via email (Appendix A). Four separate rounds of emails were sent out to the original SSPSBC which included one introductory email and three follow-ups.

3.1 Participants

The SSPSBC recruitment occurred between 2014 and 2015, and data on a total of 870 participants was collected (Tables 3.2 and 3.3): 279 male and 134 female hockey players, 74 male and 63 female soccer players, 51 male and 36 female basketball players, 81 male football players, 35 male and 66 female volleyball players, and 76 male baseball players. All athletes were between the ages of 11-17 years at the time of baseline testing. During the collection of data from the follow-up cohort (SSPSFC), all participants were over the age of 18 years old and therefore, were eligible to give personal consent. Participant consent was obtained for all participants and all procedures were approved by the University of Saskatchewan Behavioral Research Ethics Board (Appendix D). To limit the number of papers required to complete the survey, consent was obtained through implied consent on the first page of the SurveyMonkey platform (Appendix B).

3.2 SSPSBC methods

3.2.1 Chronological age

Chronological age (CA) was calculated by subtracting the date of birth from the date of tryout. Chronological age categories were constructed using 1-year intervals from the midpoints of the age; for example, the 10-year age group included participants from 9.50 to 10.49 years of age.
3.2.2 Biological age

A biological age (BA) was assessed by predicting the years from attainment of peak height velocity (PHV). PHV is a somatic maturation milestone found in both males and females. To predict when PHV would occur a maturity prediction equation from anthropometric measures was used (Mirwald, Baxter-Jones, Bailey, & Beunen, 2002); based on age, sex, height, sitting height and weight. The age from PHV, or maturity offset, estimates how many years the subject is from his age-at-PHV. A positive (+) maturity offset represents the number of years the participant is beyond PHV, whereas a negative (−) maturity offset represents the number of years the subject is before PHV. BA categories were constructed using 1-year intervals such that the -1.0 BA category included those with a BA of -1.51 to 0.49. Age at PHV was also used to create maturity categories as follows: early, +1.0 SD above the mean APHV; average, between -0.5 and +0.5 SD of mean APHV; late -1.0 SD below the mean APHV (Beunen, 1989).

3.2.3 Relative Age

Chronological age cut-off (month of birth) were identified for each team. Month of birth were quartile for both 12 month and 24-month age bands. For example, if the team used a 12-month age band with a cut-off of January 1, then the first quartile one would contain athletes born between January 1st and March 31st. For a 24 month age band then the first quartile would contain athletes born between January 1st and June 30th of the earliest year of birth.

3.2.4 Anthropometry

Height, sitting height and weight were collected following the protocols of the International Society for the Advancement of Kinanthropometry (Ross & Marfell-Jones, 1991). Using a portable stadiometer (Seca Portable Stadiometer, Hamburg, Germany) height and sitting height were measured in children, without shoes, holding their heads in the Frankfurt plane, with a precision of 0.1 cm. Body weight (kg) was measured with children in light clothing and with a
0.1 kg precision using a portable digital scale (Toledo Scale Company, Thunder Bay, Ontario, Canada). All measures were performed twice and a mean calculated, a third measurement was taken if there was a difference of more than 0.1 cm or 0.4 kg.

### 3.3 SSPSFC Survey tools

The Sports Participation Activities (SPA) module (Canadian Heritage, 2013) of the 2010 Statistics Canada General Social Survey (Appendix B) was used to collect sports participation information. The entire 32-question survey was inputted into SurveyMonkey along with additional anthropometric questions (Appendix B). A link to the survey was sent out to all SSPSBC participants via an introductory email (Appendix A) which explained the reason for contacting them as well as the purpose of the follow-up study. With many of the contact emails being those of the athlete’s parents, the introductory email prompted the individual to forward the email with the survey link to the original participant. Three follow-up emails (Appendix A) were sent out to all active email addresses reminding individuals to fill out the survey. Before completion of the SPA, participants were asked to estimate their current height and weight for future research projects.

### 3.4 Analysis

Means and standard deviations are reported for descriptive data: baseline (SSPSBC) and follow-up (SSPSFC) data are compared. Athletes who did not complete the entire follow-up survey were excluded from the follow-up analysis. The SSPSBC and SSPSFC was examined and tested to ensure that the SSPSFC cohort was a true representation of the SSPSBC cohort using ANOVA. A Chi-squared goodness of fit test was used to determine if the percentages by sex, sport, and (de)selection were representative of the original population. All data was analyzed using IBM SPSS Statistics (Version 28) and the alpha-value was set at 0.05.
4.0 Results

In 2014/2015, 870 (67% males) participants were recruited and made up the SSPSBC. All 870 were re-contacted for the 2023 follow-up cohort (SSPSFC) using the email provided at recruitment (see tables 4.1 and 4.2 for a breakdown of numbers by cohort, sport, year of test, and sex). 509 participants (58% of the SSPSBC) received the follow-up email, with 361 of the 870 SSPSBC (42%) being uncontactable (the contact information provided was not in use/updated). Of the 509 participants contacted, 65 (7%) did not open the email. Of the 442 who opened the email, 159 of 442 (36%) began the survey. Of the 159 surveys obtained, complete data was available on 140 of 159 survey (88%) and their data is presented in this document as the SSPSFC. The SSPSFC represents 18% (140 out of 870) of the SSPSBC.

A breakdown of the number of SSPSFC participants and percentage of the total sample (SSPSBC) by year of testing, selection, and sport is shown in Table 4.1 for both SSPSBC and SSPSFC and by year of testing, sex, and sport in Table 4.2. Although the numbers had decreased from 870 to 140, the percentages in each sport category were similar, as were the percentages of those selected and (de)selected.

Tables 4.1 and 4.2 shows the number of athletes by sport in the sample at baseline (SSPSBC) and follow-up 8 years later (SSPSFC). In SSPSBC, most female athletes were hockey players, followed by volleyball, and soccer players. At follow-up, most female athletes were volleyball players followed by soccer, and hockey players. In the SSPSBC nearly half the male athletes were hockey players, with approximately 13% coming from soccer, football, and baseball. The male follow-up sample had two-thirds of the athletes from hockey and volleyball and 25% from soccer.
Table 4.1: Number and percentage of Athletes for SSPSBC and SSPSFC by Sport, Selection at Try-Outs, and Year of Study

<table>
<thead>
<tr>
<th>Sport</th>
<th>SSPSBC</th>
<th></th>
<th>SSPSFC</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Selected</td>
<td>Deselected</td>
<td>Selected</td>
<td>Deselected</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Hockey</td>
<td>185</td>
<td>47%</td>
<td>208</td>
<td>44%</td>
</tr>
<tr>
<td>Soccer</td>
<td>78</td>
<td>20%</td>
<td>59</td>
<td>13%</td>
</tr>
<tr>
<td>Basketball</td>
<td>25</td>
<td>6%</td>
<td>61</td>
<td>13%</td>
</tr>
<tr>
<td>Football</td>
<td>42</td>
<td>11%</td>
<td>36</td>
<td>8%</td>
</tr>
<tr>
<td>Volleyball</td>
<td>55</td>
<td>14%</td>
<td>45</td>
<td>10%</td>
</tr>
<tr>
<td>Baseball</td>
<td>12</td>
<td>3%</td>
<td>64</td>
<td>14%</td>
</tr>
<tr>
<td>Total</td>
<td>397</td>
<td>100%</td>
<td>473</td>
<td>100%</td>
</tr>
</tbody>
</table>

*p<0.05

Table 4.2: Number of Athletes for SSPSBC and SSPSFC by Sport, Sex, and Year of Study

<table>
<thead>
<tr>
<th>Sport</th>
<th>SSPSBC</th>
<th></th>
<th>SSPSFC</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Females</td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Hockey</td>
<td>124</td>
<td>43%</td>
<td>269</td>
<td>46%</td>
</tr>
<tr>
<td>Soccer</td>
<td>63</td>
<td>22%</td>
<td>74</td>
<td>13%</td>
</tr>
<tr>
<td>Basketball</td>
<td>35</td>
<td>12%</td>
<td>51</td>
<td>9%</td>
</tr>
<tr>
<td>Football</td>
<td>0</td>
<td>0%</td>
<td>78</td>
<td>13%</td>
</tr>
<tr>
<td>Volleyball</td>
<td>65</td>
<td>23%</td>
<td>35</td>
<td>6%</td>
</tr>
<tr>
<td>Baseball</td>
<td>0</td>
<td>0%</td>
<td>76</td>
<td>13%</td>
</tr>
<tr>
<td>Total</td>
<td>287</td>
<td>100%</td>
<td>583</td>
<td>100%</td>
</tr>
</tbody>
</table>

*p<0.05
The 140 athletes (60% male) who answered the follow-up survey represent 18% of the original sample. Of these 140 participants 56 (40%) were female and 84 were male (60%). Of the 56 females, 39 out of 56 (70%) still participated in the try-out sport compared to 71% of males (60 out of 84) who still participated in the tryout sport.

4.1 - Birth Month Distribution

![Birth Month Distribution](image)

**Figure 4.1:** Birth month quartile distribution by tryout success for SSPSFC

Figure 4.1 shows the quartile distribution of SSPSFC athletes' birth months. Within this sample, there was no difference between the birth quartile distribution for either the total sample or those who were (de)selected (p > 0.05).
4.2 - Age, Height, Weight, and Maturity by Sport, Sex and Team Selection

Tables 4.3 – 4.8 show the demographics of each specific sport by sex and tryout success at baseline and follow-up for the SSPSFC divided by (de)selection.

**Table 1.3: Mean differences between selection groups in SSPSFC hockey players**

<table>
<thead>
<tr>
<th>Hockey</th>
<th>Males</th>
<th></th>
<th></th>
<th>Females</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Selected</td>
<td>Deselected</td>
<td>Selected</td>
<td>Deselected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>14.6 (0.3)</td>
<td>14.6 (0.3)</td>
<td>14.3 (0.7)</td>
<td>14.0 (0.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APHV</td>
<td>13.4 (4.0)</td>
<td>13.6 (6.4)</td>
<td>12 (0.4)</td>
<td>12.1 (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height (Cm)</td>
<td>179.1 (7.5)</td>
<td>179.5 (9.2)</td>
<td>169.8 (6.9)</td>
<td>168.1 (3.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>85.1 (11)</td>
<td>90.9 (14.3)</td>
<td>72.2 (14.9)</td>
<td>61.8 (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Father's height (Cm)</td>
<td>177.6 (6.2)</td>
<td>180.2 (5.3)</td>
<td>179.9 (8.2)</td>
<td>178.8 (5.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother's height (Cm)</td>
<td>165.4 (5.4)</td>
<td>164.5 (5.9)</td>
<td>166 (6.2)</td>
<td>160 (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predicted adult height (Cm)</td>
<td>180.5 (4)</td>
<td>179.4 (4.1)</td>
<td>168.7 (4.3)</td>
<td>167.4 (3.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final height (Cm)</td>
<td>173.2 (6)</td>
<td>170.9 (6.6)</td>
<td>166.2 (5.4)</td>
<td>163.2 (5.8)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<0.05* between (de)selected by sex

It was found that for female soccer players (table 4.5), there were significant differences in age, final height, predicted adult height, and predicted APHV between (de)selection athletes. For male soccer players, there was a significant difference between the age at tryout. For football players (table 4.6), a significant difference was found in the age at the tryout and the final height (*p<0.05*). No significant difference was found in the maturity status (average age at PHV) between the selected and deselected SSPSFC (Table 4.3). No sport specific difference is age at PHV were found in SSPSFC (Tables 4.4-4.8), apart from female soccer players (Table 4.4) were it was found that deselected females reached maturity earlier (mean age PHV) than the selected
females. At baseline (SSPSBC) the average age of PHV was 12.1 ± 0.5 years for girls and 13.6 ± 0.6 years for boys. 18% of females in SSPSBC were defined as early maturers, 65% as average maturers and 18% as late maturers. In males the percentages were 18% early, 68% average and 15% late. In the SSPSFC 23% of females were early, 55% average and 21% late maturers. In males SSPSFC the percentages were 19% early, 67% average and 14% late.

Table 4.4: Mean differences between selection groups in SSPSFC soccer players

<table>
<thead>
<tr>
<th>Soccer</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Selected</td>
<td>Deselected</td>
</tr>
<tr>
<td>Age (Yrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13.5 (0.5)</td>
<td>14 (1.3) *</td>
</tr>
<tr>
<td>APHV (Yrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13.8 (0.6)</td>
<td>13.7 (0.5)</td>
</tr>
<tr>
<td>Height (Cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>179.8 (5.1)</td>
<td>180.7 (6.5)</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>79.8 (11.5)</td>
<td>79.9 (13.3)</td>
</tr>
<tr>
<td>Father’s height (Cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>176.5 (10.8)</td>
<td>178.2 (7.3)</td>
</tr>
<tr>
<td>Mother’s height (Cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>162.3 (6)</td>
<td>166.9 (6.6)</td>
</tr>
<tr>
<td>Predicted adult height (Cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>182.5 (5.1)</td>
<td>179.5 (4.6)</td>
</tr>
<tr>
<td>Final height (Cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>163.2 (8.1)</td>
<td>165.4 (13.8)</td>
</tr>
</tbody>
</table>

*p<0.05 between (de)selected by sex

Table 4.5: Mean differences between selection groups in in SSPSFC basketball players

<table>
<thead>
<tr>
<th>Basketball</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Selected</td>
<td>Deselected</td>
</tr>
<tr>
<td>Age (Yrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.1</td>
<td>13.9 (0.7)</td>
</tr>
<tr>
<td>APHV (Yrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13.8</td>
<td>13.9 (0.6)</td>
</tr>
<tr>
<td>Height (Cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>177.8</td>
<td>182.1 (7.1)</td>
</tr>
</tbody>
</table>
Weight (Kg) & 78.5 & 82.6 (15.1) & 108.9 & 71.9 (7.5) \\
Father's height (Cm) & 170.2 & 177.4 (5.8) & 185.4 & 189.2 (6.7) \\
Mother's height (Cm) & 158.7 & 167.6 (5.5) & 177.8 & 166.1 (9.9) \\
Predicted adult height (Cm) & 176.5 & 180.7 (3.4) & 11.2 & 171.3 (6.8) \\
Final height (Cm) & 164.1 & 164.6 (5.9) & 188 & 168.4 (9.8) \\

*p<0.05* between (de)selected by sex

**Table 4.6:** *Mean differences between selection groups in SSPSFC football players*

<table>
<thead>
<tr>
<th>Football</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Selected</td>
</tr>
<tr>
<td>Age (Yrs)</td>
<td>15.1 (0.3)</td>
</tr>
<tr>
<td>APHV (Yrs)</td>
<td>13.1 (6.4)</td>
</tr>
<tr>
<td>Height (Cm)</td>
<td>180.7 (5.7)</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>91.1 (16.2)</td>
</tr>
<tr>
<td>Father's height (Cm)</td>
<td>180.1 (6.2)</td>
</tr>
<tr>
<td>Mother's height (Cm)</td>
<td>168.5 (4.4)</td>
</tr>
<tr>
<td>Predicted adult height (Cm)</td>
<td>180.2 (6.1)</td>
</tr>
<tr>
<td>Final height (Cm)</td>
<td>176.5 (6.4)</td>
</tr>
</tbody>
</table>

*p<0.05* between (de)selected. Note no female football players were tested.
Table 4.7: Mean differences between selection groups in in SSPSFC volleyball players

<table>
<thead>
<tr>
<th>Volleyball</th>
<th>Males</th>
<th>Females^</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Selected</td>
<td>Selected</td>
</tr>
<tr>
<td>Age (Yrs)</td>
<td>16.4 (0.6)</td>
<td>15.6 (1.2)</td>
</tr>
<tr>
<td>APHV (Yrs)</td>
<td>13.6 (0.3)</td>
<td>12.1 (0.6)</td>
</tr>
<tr>
<td>Height (Cm)</td>
<td>187.9 (0)</td>
<td>178.6 (6.1)</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>83.9 (12.8)</td>
<td>76.5 (13.9)</td>
</tr>
<tr>
<td>Father's height (Cm)</td>
<td>181.5 (1.7)</td>
<td>184.5 (6.9)</td>
</tr>
<tr>
<td>Mother's height (Cm)</td>
<td>173.9 (5.4)</td>
<td>169.2 (7.3)</td>
</tr>
<tr>
<td>Predicted adult height (Cm)</td>
<td>186.1 (0.8)</td>
<td>175.9 (5.8)</td>
</tr>
<tr>
<td>Final height (Cm)</td>
<td>184.9 (1.3)</td>
<td>175.2 (6.1)</td>
</tr>
</tbody>
</table>

*p<0.05 between (de)selected by sex. Note ^There were no selected females in the SSPSFC

Table 4.8: Mean differences between selection groups in in SSPSFC baseball players

<table>
<thead>
<tr>
<th>Baseball</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Selected</td>
</tr>
<tr>
<td>Age (Yrs)</td>
<td>14.7 (0.3)</td>
</tr>
<tr>
<td>APHV (Yrs)</td>
<td>13.6 (0.5)</td>
</tr>
<tr>
<td>Height (Cm)</td>
<td>180.3 (8.5)</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>88.1 (8.3)</td>
</tr>
<tr>
<td>Father's height (Cm)</td>
<td>174.6 (15.7)</td>
</tr>
<tr>
<td>Mother's height (Cm)</td>
<td>169.5 (7.6)</td>
</tr>
<tr>
<td>Predicted adult height (Cm)</td>
<td>179.3 (5.6)</td>
</tr>
<tr>
<td>Final height (Cm)</td>
<td>171.7 (8.6)</td>
</tr>
</tbody>
</table>

*p<0.05 between (de)selected. Note no female baseball players were tested.
4.3 - Effects of Team Selection on Long Term Sports Participation

When looking at the percentage of participants who no longer participated in sport, it was found that 14% of girls who were (de)selected no longer participated in sport compared to 16% of boys. When looking at the percentage of athletes who were still playing the same try-out sport at follow-up (Table 4.9), it was found that 48 (34%) continued to participate in their indicated tryout sport. Out of these 48 athletes, 33% played hockey, 31% played soccer, 11% played basketball, 2% played football, 21% played volleyball, and 2% played baseball. It was found that 28 of the 48 (58%) individuals who were still playing the same sport they participated in at tryout were those who had been selected.

Table 4.9: Athletes Playing the Same Sport at Baseline and Follow-up in SSPSFC by (de)selection and Sex

<table>
<thead>
<tr>
<th>Sport</th>
<th>Males</th>
<th></th>
<th>Females</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Selected</td>
<td>Deselected</td>
<td>Selected</td>
<td>Deselected</td>
</tr>
<tr>
<td>Hockey</td>
<td>43%</td>
<td>33%</td>
<td>28%</td>
<td>8%</td>
</tr>
<tr>
<td>Soccer</td>
<td>24%</td>
<td>17%</td>
<td>22%</td>
<td>30%</td>
</tr>
<tr>
<td>Basketball</td>
<td>6%</td>
<td>17%</td>
<td>6%</td>
<td>8%</td>
</tr>
<tr>
<td>Football</td>
<td>9%</td>
<td>8%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Volleyball</td>
<td>9%</td>
<td>0%</td>
<td>44%</td>
<td>54%</td>
</tr>
<tr>
<td>Baseball</td>
<td>9%</td>
<td>25%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

*p<0.05

Of the females, 21 individuals (38%) who had been selected at tryouts and 18 (32%) who had been deselected were still participating in some sort of sport. A similar result was found in males; 29 out of 84 (35%) who were selected were still participating compared to 31 (37%) out of 84 who were (de)selected were still participating in sport, 84 months later.
Figure 2.2: Reasons For Dropping Out of Sport by Percentage

For those athletes who had chosen to drop out of sport (Figure 4.2), it was found that the top reason provided was a lack of time (32%). The second most common reason was experiencing an injury or health issue (14%).
5.0 Discussion

The purpose of this study was to examine if being (de)selected from a sports tryout in adolescence affected sports participation in the tryout sport, and other sports, in emerging adulthood. For the first hypothesis, it was found that selection did affect long-term sports participation in the participants tryout sport with 58% of those who had been selected at the sport team tryout still competing in that sport today compared to 42% who had been deselected (48 athletes had continued in the tryout sport). As for the second hypothesis, being (de)selected at a provincial sports team tryout affected long-term term sports participation. 14% of girls who were (de)selected had stopped playing sports altogether in comparison to 16% of boys. It was also found that the top two reason for dropping out of sports was lack of time and suffering from an injury.

The Saskatchewan Sports Participation Study (SSPS) (2013-2023) study followed up a cohort of athletes who were recruited in 2014/2015 and who were initially followed until 2017. In 2017, the question asked was, did being (de)selected from a sports team, at tryouts, affect short-term sports (36 months) participation? It was found that although deselection did not affect short-term sports participation, there were declining trends. These trends showed that athletes who were not selected for 3 of the 6 sports (soccer, basketball, and volleyball) were more likely to report a different sport as their main sport at 36 months (Baxter-Jones et al., 2020).

Furthermore, those who participated in those 3 sports and were selected were more likely to still be participating in the tryout sport at the 36-month mark. Building on these results, the purpose of the present thesis were to: 1) determine if being deselected from a team sport would result in a decrease in long-term sports participation in the tryout sport and; 2) determine if being deselected for a team sport would affect continued participation in that sport.
5.1 Growth, Maturation, and the RAE

Of the initial 870 athletes (SSPSBC) 140 were recruited to be part of the present study (SSPSFC) representing 18% of the initial sample. Importantly, it was found that the percentage of participants, by sport, sex, and (de)selection at 84-month follow-up was similar to the percentage distributions by sport, sex, and (de)selection at study entry (tables 4.1 and 4.2). In addition, very few differences were found between the sports in terms of age, APHV, height, weight, and parental heights in the SSPSFC at initial testing (Tables 4.3-4.8). Since this finding was found in the SSPSBC (Baxter-Jones et al. 2020; Appendix E), this suggests that the SSPSFC sample was a true representation of the SSPSBC sample with regarding growth and maturation parameters at study initiation.

In the SSPSBC, it was found that athletes (n=870) who were selected for the team were generally larger and more mature than those who were deselected. These results highlighted the need for coaches to be more cognizant of the athletic advantages related to advanced growth due to birthdate in the selection year and the advantages early-maturing athletes may have over those who are late-maturing (Baxter-Jones et al., 2020). In the SSPSFC, very few maturational differences were found in those athletes at 84-months follow-up who were selected and deselected at baseline. It was also found that the follow-up cohort distribution of early, average and late developers was similar to the percentages seen in the baseline cohort (SSPSBC). The most prominent differences between the two cohorts were found in female soccer players with significance being found in age, predicted APHV, predicted adult height, and final height. Female players who were selected were found to be both taller and older than those who were deselected. Significant differences were also found in the age of male soccer players, which found that deselected players were older than those who were selected. Although it is difficult to assume why female and male soccer players had the most significant differences, previous
research suggests that is, the sport of soccer places significant emphasis on technique and agility over physical size. This may be a possible explanation for the large size discrepancy between players (Baxter-Jones et al., 2020; Cumming et al., 2018; Figueiredo et al., 2019). The technical nature allows players with vastly different body types the chance to succeed. However, this anecdotal reason is yet to be backed by scientific literature, indicating further research is needed. Additionally, these results could have simply been due to chance as well. It must also be mentioned that the type of selection measures that were used at tryouts are unknown. Players may have been chosen based on a multitude of different subjective reasons. Like the mean differences in growth parameters, the analysis of the RAE showed that no differences were found in the SSPSFC. RAE are most commonly found during a period when individuals are going through maturational changes in adolescence (Beals et al., 2018; Figueiredo et al., 2019). However, the SSPSBC (Appendix F). results have probably been watered down given the SSPSFC represents only 18% of the SSPSBC.

5.2 Deselection and Exit from Sport

In the analysis of the primary hypothesis, determining if being deselected for a team sport would affect continued participation in sport, it was found that there was a significant difference between deselected and selected athletes. The results showed that 58% of selected athletes were still participating in that same try-out sport at follow-up. This can be considered a positive result for the provincial sporting organizations who participated in the study. With the 6 sports in the SSPS (soccer, hockey, basketball, volleyball, baseball, football) being among the most popular in Canada, there is ample opportunity to go on to compete at higher levels such as post-secondary or professional competition. There are also ample opportunities to continue playing the chosen sport at the recreational level which may satisfy individuals as they enter emerging adulthood.
This could partially explain why such many individuals who were selected continued to play different sports than the try-out sport. Five of the six sports have local post-secondary opportunities available as well as in the neighboring provinces of Alberta and Manitoba. Future research should focus on why athletes choose to stay in those sports and the potential benefit of specializing in that sport during this critical period.

The analysis of the second hypothesis, determining if being deselected from a team sport will result in a decrease in long-term sport participation in any sport, found that there were no significant differences between athletes who were deselected and athletes who were selected. Of the females 38%, who had been selected at tryouts and 32% who had been deselected were still participating in sport. A similar result was found in males, 35% of those who were selected were still participating compared to 37% who were deselected but still participating in sport 84 months later. Although significance was not achieved, the results are positive from an overall sports participation standpoint. These findings align with the body of literature surrounding how adults return or continue sport (Agnew et al., 2018; Neely, 2022; Williams & MacNamara, 2020).

Given that this was a provincial team tryout may athletes would have returned to their league teams and continued to play and tried out for the provincial team at a later age group. Many of these athletes also likely had ample opportunities to try other sports as they entered emerging adulthood. Building on this, deselection from a provincial team may not truly measure the effects of (de)selection.

It is widely known that the definition of sport is increasingly changing with games being modified in order to become more accessible so athletes can return to sport at an older age (Grant, 2001; Tammelin et al., 2003). A perfect example is the popular sport of pickleball. What was once seen as a modified game of tennis has quickly become one of the fastest-growing
sports in North America. Studies have shown that there are many social and cardiovascular health benefits which might explain the popularity rise among the younger generation (Cerezuela et al., 2023; Ryu et al., 2018). With that being said, further research is needed to better understand the types of sports and leisure activities athletes choose to go into and why they chose them.

5.3 Sports Participation

When looking at the general sports participation levels of the SSPSFC group that completed the follow up survey, very little difference was found when comparing to the average rates of youth sports participation in Canada. It was found that of the 140 individuals who completed the survey, 70% of females and 71% of males still participated in sport. This aligns with the Canadian rates of participation prior to the COVID-19 pandemic which reported that 74% of youth participated in some form of sport (Participation, 2020). However, these participation rates are significantly higher than that of the average Canadian adult population. According to the Canadian Fitness and Lifestyle Research Institute’s 2019-2021 Physical Activity Monitor (PAM), about a quarter (27%) of adults participate in sport (Monitoring & Tracking the Field, 2022).

An explanation for this drastic difference in the rates of participation could have to do with the fact that the sample was taken from those trying out at the provincial team level. In all six of the sports, this is one of the highest levels of competition in the province of Saskatchewan. It is well known that in the North American “pay to play” model, socioeconomic status has been shown to play a significant role in sport participation (Tandon et al., 2021; White & McTeer, 2012). Athletes who can afford to play sports in their youth have been shown to have a higher chance of going on to play competitively in their adolescent years (Spreitzer, 1994). With that
being said, just being at the provincial sports team tryouts may have given athletes a better chance of continuing to participate in the sport well into emerging adulthood.

The full effects of emerging adulthood could explain the analysis of why athletes no longer played sports (Figure 4.2). The most common reasons as to why athletes dropped out of sport altogether were lack of time and health/injury. These results align with the significant lifestyle changes that are commonly seen during this period. The period of emerging adulthood is often associated with a decrease in overall physical activity (Barbour-Tuck et al., 2018; Metcalf et al., 2020). During this period, individuals are often entering either the workforce or post-secondary education which in turn, can impact the amount of time allocated to physical activity (Arnett, 2000). Although a lack of time is possibly explained by the commonalities of emerging adulthood, further research is needed to better understand how this lack of time affected their sports participation. The second most common reason, injury/health was reported by 14.7% of the follow up sample. Previous research has shown that the residual effects of an injury can significantly influence an athlete's chances of being selected for a team as well as their decision to continue in the sport altogether (Maffulli et al., 2010). This possible explanation could be strengthened through the Provincial team sport system. Club programs sometimes face competition from provincial sport programs for the time of these athletes, which raises the participants' physical demands. Prior research has brought attention to the potential dangers of child overtraining (Alves et al., 2006; Walters et al., 2018). The athletes' ability to continue in their sport may have been hampered by overuse injuries brought on by the physical demand placed on them. With this consideration, additional research is needed to further strengthen the potential correlations between injuries and (de)selection.
Although significance was achieved, these differences between groups are unlikely to affect the current rates in sports participation given that this sample size would have reached full maturity (Baxter-Jones et al., 2020; Malina, 1994). Given that all the individuals had reached the age of emerging adulthood, it is more likely that lifestyle factors affected their current rates of sports participation rather than biological factors (Arnett, 2000; Dave et al., 2021).

5.4 Limitations

Although the data collected in the SSPSFC is of value, limitations do still exist. The SSPSBC data collection were completed long before I began my graduate program which means I was not present for either. The first limitation is that I was not there to choose the method by which the survey was sent out. Seeing as this is a longitudinal study, the use of outdated technology may have hindered the response rate of participants when collecting follow-up data. The second limitation is, that because I was not there for the studies inception, I was not part of the discussion as to which surveys will be sent out. Had the study been solely focused on the long-term effects of sports participation, additional surveys may have been chosen to enhance the results. For example, additional questions related to the level of sport as well as the chosen occupation of the individual may have further enhanced future research and information that can be shared with athletes and sports organizations. My primary role for SSPS was to collect the 84-month follow-up data (SSPSFC) survey, mail-out and use the Sports Participation Activities (SPA) Survey to analyze the trends in long-term sports participation after an athlete was either selected or deselected from their respected provincial team tryout. The SPA survey remained unchanged from the baseline and the 36-month follow-up data collection and can be found in the appendices as a reference.
To choose the most reliable measurements and surveys to address these research issues, I leaned on the experience of people who were engaged in the baseline collection of data (SSPSBC). Likewise, I was not present for the baseline data collection at the tryouts, so I cannot comment on the accuracy or dependability of the data collection, even though the data collectors had training and familiarization in appropriate anthropometric measure data collecting. Another limitation of the study is the fact that this was a provincial team tryout. As mentioned previously, the provincial sport team is one of the highest levels of competition in Saskatchewan. Many athletes who were not selected for the provincial team would likely go back to their zone teams or be able to find a lower level of competition should they choose to continue participating in that sport. This may not be true for an athlete who is trying out for a high school team and may not have the skill or athletic background to fall back on should they be cut.

This, in turn, brings about the question of whether this study truly measures the effects of deselection. There is a strong possibility that some form of deselection already existed prior to the selection process of a provincial team. Research has shown that even being chosen last or not chosen at all for a sports team during recess can affect long-term sports participation. This is worrisome as school sports are often considered the most accessible form of sports in the North American sporting system. Thanks to the work done by Gleddie et al (2019) on the best practices of deselecting kids, structures must be in place to ensure that the chances of individuals choosing not to pursue a sport due to not being selected is mitigated. It must also be mentioned that these results were exclusive to Saskatchewan. Although coaching education on best practices has inevitably improved, the same study done in other provinces may yield entirely different results.
5.5 Future Directions

Although the research hypothesis were rejected this is probably positive for many local sporting bodies with selected athletes being more likely to stay in that same sport long-term. With regards to the second hypothesis, also rejected, many positive outcomes were found in terms of long-term sports participation, it seems as though (de)selected individuals often continue to participate in another sport. However, as mentioned in the limitations, the glaring question is if this study truly examined the long-term effects of (de) selections. Future studies should focus on more accessible forms of sport such as high school or community sports (depending on geographical location). It would be safe to assume that at more accessible levels of sports, the effects of not being chosen for a team would be significantly more prominent given that the socioeconomic status of the population would be lower.

Given that this study was quantitative by nature, a qualitative metric could potentially be used to strengthen the understanding of why athletes choose their paths. Discussions and interviews with coaches and players would be highly beneficial to further inform best practices and mitigate the negative effects of deselection. As previously mentioned, the psychological effect of deselection is well documented (Blakelock et al., 2016; Neely et al., 2018; Wilkinson, 2021). Interviews with these players may help uncover strategies that sporting organizations and coaches can use to help prepare athletes for potential deselection. Recent studies have shown that being deselected can help athletes build mental and emotional strength through post-traumatic growth (Neely, 2022; Wilkinson, 2021; Williams & MacNamara, 2020). These results suggest that future research should focus on empowering athletes to use deselection as a motivator in both their sporting and occupational careers.

Another area that must be examined in future research could align with the idea of supporting athletes’ transition from their sport into the workplace. Similar to being deselected,
this transition period has been highlighted as a traumatic period that includes the need for coping resources (Brown et al., 2018; Stambulova et al., 2009; Surujlal & Van Zyl, 2014). Previous research has pointed to the importance of having workshops and counselling programs to help prevent the negative consequences of transitioning out of elite sport (Knights et al., 2016; Stambulova et al., 2009). The work done by Stankovich et al in the early 2000s found that athletes who have been deselected are left to redefine their personalities and those who see little self-worth beyond athletics face additional difficulties when competing for future career opportunities (2001). Previous recommendations by Surujlal & Van Zyl have pointed to the need for compulsory counselling to help facilitate healthy transitions out of sport (2014). This aligns with the current findings that showed many athletes finding new ways to be active. This may suggest that the issues of being deselected may need to focus on aspects outside of physical health and more so look at preventative-based programming. Although playing elite sports can bring about many transferable skills, athletes have been highlighted to be unprepared for the labor market (Robnik et al., 2022). Designing mentorship programs around helping athletes learn how to articulate transferable skills developed through sports may help provide a positive direction for athletes to follow (Knights et al., 2016; Zou et al., 2016). However, further research is needed to investigate and validate potential course and mentorship-style programs which may assist athletes going through this transition.

5.6 Conclusion

In this cohort of athletes being (de) selected at tryout did not seem to affect long-term sports participation in the try-out sport and being deselected from a provincial team sport team did not seem to affect long-term sports participation in other sports in emerging adulthood. At the time of the data collection for the SSPS, maturational differences did not affect sports participation. A RAE was not found with the reduced sample size of the SSPS at follow-up. This
information could be helpful for coaches and sporting organizations as they navigate the difficult world of deselecting athletes. Overall, the results from both hypotheses can be deemed as positive. The results from suggest that there are ample opportunities to continue participating in sport regardless of whether you were (de)selected for a provincial team. Suggesting that those who were (de)selected in adolescence had ample opportunities to continue in either the try-out or others sport as they entered emerging adulthood.
6.0 References


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APPENDIX A: PRIMARY EMAIL OUTREACH

Dear [Participant],

I hope this email finds you well. I am contacting you as I am recollecting data for The Saskatchewan Sports Participation Study. You were a part of our baseline data collection which included taking measurements of your height and weight, as well as answering questions about your involvement in sports.

As a reminder, you participated in our baseline data collection between 2014 and 2015 at your respected sport’s provincial team tryout. Although there were a number of measures performed at the tryout, I only need you to complete the Sports Participation Activities (SPA) survey.

Your participation in the survey will help us to understand the long-term effects of (de)selection on sports participation by comparing the data collected at the tryout with the current data.

The survey should take around 5 minutes to complete. To access the survey, please click on the following link: https://www.surveymonkey.ca/r/MX39XK3

Please note that your participation in this survey is completely voluntary and you can choose to withdraw at any time. Your responses will be kept confidential and will only be used for research purposes. For more information about the study and detailed procedures, please read the attached consent form. If you have any questions about the study procedures, please feel free to contact me at (204)-899-9092 or by email at tjh454@usask.ca.

We appreciate your time and support to help continue sport-based research in Saskatchewan!

Best,

Tobias Hyrich-Krueger
Dear [Participant],

I hope this email finds you well. I am contacting you as I am recollecting data for The Saskatchewan Sports Participation Study. Your child, *insert name*, was a part of our baseline data collection which included taking measurements of their height and weight, as well as answering questions about their involvement in sports.

As a reminder, they participated in our baseline data collection between 2014 and 2015 at their respected sport’s provincial team tryout. Although there were a number of measures performed at the tryout, I only need them to complete the 5-minute Sports Participation Activities (SPA) survey.

Here is the link: https://www.surveymonkey.ca/r/MX39XK3

Their participation in the survey will help us to understand the long-term effects of (de)selection on sports participation by comparing the data collected at the tryout with the current data.

If you don’t mind, would you please forward this email to your child who participated in the tryout? For more information about the study and detailed procedures, feel free to contact me at (204)-899-9092 or by email at tjh454@usask.ca.

We appreciate your time and support to help continue sport-based research in Saskatchewan!

Best,

Tobias Hyrich-Krueger

Research Team.
APPENDIX B: SPORTS PARTICIPATION ACTIVITIES QUESTIONNAIRE

Personal Information
Name
Email Address
Phone Number

What is your height in inches?

What is your weight in pounds?

Would you be willing to participate in future studies and be contacted again for potential participation?

☐ Yes
☐ No
Question 1: Did you regularly participate in any sports during the past 6 months?
- Yes
- No (proceed to Question 28)
- Don’t know (proceed to Question 28)

Question 2: Which sports did you participate in? (Choose one sport for this question. You will have an opportunity to report other sports later in the questionnaire)
- Don’t know
- Sport participation description:

Question 3: How often, in season, did you participate in the above sport?
- 2 to 3 times per month
- Once or twice per week
- 3 or more times per week
- Don’t know

Question 4: Do you participate in this sport primarily for competition or recreation?
- Competition
- Recreation
- Don’t know

Question 5: Do you participate in another sport?
- Yes
- No (proceed to Question 13)
- Don’t know (proceed to Question 13)

Question 6: Which sports did you participate in?
- Don’t know
- Sports participation description:
Question 7: How often, in season, did you participate in the above sport?
- 2 to 3 times per month
- Once or twice per week
- 3 or more times per week
- Don’t know

Question 8: Do you participate in this sport primarily for competition or recreation?
- Competition
- Recreation
- Don’t know

Question 9: Did you participate in yet another sport?
- Yes
- No (proceed to Question 13)
- Don’t know (proceed to Question 13)

Question 10: Which sports did you participate in?
- Don’t know
- Sport participation description:
Question 11: How often, in season, did you participate in the above sport?
- 2 to 3 times per month
- Once or twice per week
- 3 or more times per week
- Don’t know

Question 12: Do you participate in this sport primarily for competition or recreation?
- Competition
- Recreation
- Don’t know

Question 13: Did you participate in any competitions or tournaments in the past 6 months?
- Yes
- No (proceed to Question 22)
- Don’t know (proceed to Question 22)

Question 14: For which sport(s)? (Choose one sport for this question. You will have an opportunity to report other sports later in the questionnaire)
- Don’t know
- Sport participation description:

Question 15: Was it at the local, regional, provincial or national level?
- Competitions between schools or between teams within a school or at work should be coded as other. Refer to the sport from question 14.
- (Mark all that apply)
- Local
- Regional
- Provincial
- National
- Don’t know
- Other (please specify)
Question 16: Did you participate in any other competitions or tournaments in the past 6 months?
○ Yes
○ No (proceed to Question 22)
○ Don’t know (proceed to Question 22)

Question 17: For which sport?
○ Don’t know
○ Sport participation description:

Question 18: Was it at the local, regional, provincial or national level?
○ Local
○ Regional
○ Provincial
○ National
○ Don’t know
○ Other (please specify)

Question 19: Did you participate in any other competitions or tournaments in the past 6 months?
○ Yes
○ No (proceed to Question 22)
○ Don’t know (proceed to Question 22)

Question 20: For which sport?
○ Don’t know
○ Sport participation description:
Question 21: Was it at the local, regional, provincial or national level?

- Local
- Regional
- Provincial
- National
- Don’t know
- Other (please specify)

- Yes
- No
- Don’t know

Question 23: Is sport very important, somewhat important or not important in providing you with: ... physical health and fitness?

- Very important
- Somewhat important
- Not important
- Don’t know

Question 24: Is sport very important, somewhat important or not important in providing you with: ... family activity?

- Very important
- Somewhat important
- Not important
- Don’t know

Question 25: Is sport very important, somewhat important or not important in providing you with: ... new friends and acquaintances?

- Very important
- Somewhat important
- Not important
- Don’t know

Question 26: Is sport very important, somewhat important or not important in providing you with: ... fun, recreation and relaxation?

- Very important
- Somewhat important
- Not important
- Don’t know
Question 27: Is sport very important, somewhat important or not important in providing you with: ... a sense of achievement and skill development?

- Very important (proceed to Question 29)
- Somewhat important (proceed to Question 29)
- Not important (proceed to Question 29)
- Don’t know (proceed to Question 29)

Question 28: Are there any particular reasons why you did not regularly participate in any sports? **ONLY COMPLETE THIS QUESTION IF YOU DID NOT REGULARLY PARTICIPATE IN ANY SPORTS DURING THE PAST 6 MONTHS.** (Mark all that apply)

- No particular reason
- Not interested
- Programs not available in the community
- Do not have the time
- Do not want to be committed to regular schedule
- Facilities not available
- Too expensive
- Health/injury
- Age
- Disability
- Participated casually only for leisure
- Don’t know
- Facilities not available
- Other (please specify)

Question 29: During the past 6 months, have you been involved in amateur sport as a: ... coach?

- Yes
- No
- Don’t know

Question 30: During the past 6 months, have you been involved in amateur sport as a: ... referee/official/umpire?

- Yes
- No
- Don’t know
Question 31: During the past 6 months, have you been involved in amateur sport as a: ... administrator or helper?

☐ Yes
☐ No
☐ Don’t know

Question 32: During the past 6 months, have you been involved in amateur sport as a: ... spectator at amateur sports competitions?

☐ Yes
☐ No
☐ Don’t know
APPENDIX C: PARTICIPANT CONSENT

Saskatchewan Sports Participation Study
College of Kinesiology, University of Saskatchewan
Research Participant Information and Consent Form

Introduction:
You are invited to participate in an 84-month follow-up of the Saskatchewan Sport Participation Study. You participated in this study initially between 2013 and 2018. Your participation in this follow-up study is entirely voluntary, and you may withdraw at any time without penalty. Before you decide to participate it is important that you understand what the research involves. This consent form will tell you about the study, why the research is being done, and your role as a volunteer along with the possible benefits, risks and discomforts involved. If you decide to participate you will be required to sign this consent form. Please read this form carefully and feel free to ask any questions you might have.

Purpose:
The objective of this study is to examine the potential long-term effects of being deselected (being cut) from an open tryout in sports participation. This new data will be used in conjunction with previously collected data to investigate the effects that sports tryouts have on (de)selection. All participants who are being contacted will have previously filled out the Sports Participation & Activities Questionnaire (SPA) at a provincial team tryout of their respective sport between 2014 and 2015. The questions on the survey were regarding the sports you participated in and your enjoyment and experience in the sport.

Procedures:
If you agree to participate in this follow-up study your participation will consist of filling out one online questionnaire, version of the SPA, which will take around 5 minutes to complete. The online software Survey Monkey is being used. Survey Monkey stores all its data in secure facilities located in Canada. Please see the online privacy policy: https://www.surveymonkey.com/mp/legal/privacy/?ut_source=footer

You will be sent a notice via email (including a study ID number) prior to the survey being available online and occasional emails as a reminder to complete your online survey. Participants are allowed to do the survey over multiple sessions, as all questions will be automatically saved upon answering.

Potential Risks:
There are no foreseeable risks for your participation in this study. However, previous research has shown that drop out from sport can cause emotional distress and so completion of the survey may bring back these emotions. If you do feel emotional distress, please call the province-wide Professional Health Advice and Mental Health Support number, 811. Additionally, any answers provided in the questionnaire will not be used to evaluate by coaches) as they are not involved in the study and have no access to any of your information.

Potential Benefits:
The benefits of participating in this study relates not to you per se but to the next generation of youth at try-outs and the information collected will increase the knowledge of how environmental factors may play a role in team selection, self-perception, and coaching behaviors.

Compensation:
There is no direct compensation for participating in the study. You will, however, be eligible for a draw prize ($100 amazon gift card). Upon completion of the online survey, all participants will be included in a draw that will take place at end of December 2023.
Confidentiality:
While absolute confidentiality cannot be guaranteed, every effort will be made to ensure that the information you provide for this study is kept entirely confidential. Dr. Baxter-Jones has your contact information stored electronically on a USask password-protected server, obtained from your previous involvement in the study (2013-2018). He will provide email addresses to the student researcher. When you reply to the questionnaire you will be asked to enter a Study ID number only. In this way, only the student researcher and Dr. Baxter-Jones will be able to link back the study number to your personal information. Your personal information is stored separately from the questionnaire data and will be stored for a period of 5 years. Your name will not be attached to any information (other than the contact information stored by Dr. Baxter-Jones), nor mentioned in any study report, nor be made available to anyone, including team coaches, except the research team. It is the intention of the research team to publish the results of this research in scientific journals and to present the findings at related conferences and workshops, but your identity will not be disclosed.

Right to Withdraw:
It is understood that you will be free to withdraw from the study at any time without penalty. You do not have to answer all questions. You can withdraw any of your data at any time although the survey data will be collected using a study ID (only known to Dr. Baxter-Jones). Your right to withdraw data from this study will apply until data collection is completed (December 2023). After this point, it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data. Prior to December 2023, you can withdraw at any time by contacting Dr. Adam Baxter-Jones (Faculty phone: 966-1078, email: baxter.jones@usask.ca).

Data Storage
Current data from your original participation is stored in a locked filing cabinet in Dr. Baxter-Jones’s locked office in the University of Saskatchewan’s PAC. Electronic files from the current study are stored securely on password protected USask server, OneDrive, which is accessible by the student researcher and the PI. Once data collection is complete, it will be destroyed 5 years post-publication.

Follow-up, Questions or Concerns:
Please be assured that you may ask any question, at any time. Should you have any concerns about this study or would like more information please contact Dr. Adam Baxter-Jones (Faculty phone: 966-1078, email: baxter.jones@usask.ca). At the end of the study a summary of the results will be emailed to you, not your individual results, by December 2024.

This research project has been reviewed and approved on ethical grounds by the University of Saskatchewan Research Ethics Board. If you have any questions regarding your rights as a participant or concerns about your experiences while participating in this study, you should contact the Research Ethics Office via email at ethics.office@usask.ca or phone at (306) 966-2975. Out-of-town participants may call toll-free at (888) 966-2975.

Consent:
I have read and understood the purpose and procedures of this study, as described, and I voluntarily agree to participate. I understand that at any time during the study, I will be free to withdraw without penalty. I understand the contents of the consent form and by completing the survey am giving implied consent to use both the data collected during in the previous study and the present study.
APPENDIX D: ETHICAL APPROVAL

Certificate of Approval

Application ID: 3950
Principal Investigator: Adam Baxter-Jones  
Department: College of Kinesiology

Locations Where Research Activities are Conducted: Data collection will take place remotely through online application and telephone surveys, Canada

Student(s): Tobias Hyrich-Krueger
Funder(s): University of Saskatchewan

Title: The long-term effects of (de)selection on continued sports participation in Emerging Adulthood

Approved On: 16-May-2023
Expiry Date: 16-May-2024
Approval Of: Behavioural Research Ethics Application

Consent Form
Email Outreach
Survey

Acknowledgment Of: TCPS2 CORE Certificate - Tobias Hyrich-Krueger

Review Type: Delegated Review

CERTIFICATION
The University of Saskatchewan Behavioural Research Ethics Board (Beh-REB) is constituted and operates in accordance with the current version of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans TCPS 2 (2022). The University of Saskatchewan Beh-REB has reviewed the above-named project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this project, and for ensuring that the authorized project is carried out according to the conditions outlined in the current approved protocol. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

ONGOING REVIEW REQUIREMENTS
Any significant changes to your proposed method, or your consent and recruitment procedures must be reported to the Chair through submission of an amendment for Beh-REB consideration in advance of implementation.

To remain in compliance, a status report (renewal of closure form) must be submitted to the Beh-REB Chair for consideration within one month prior to the current expiry date each year the project remains open, and upon project completion. Please refer to the Research Ethics Office website for further instructions and current forms.

Digitally Approved by Diane Martz  
Vice-Chair, Behavioural Research Ethics Board  
University of Saskatchewan
APPENDIX E: FOLLOW-UP STUDY

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The role of growth and maturation during adolescence on team-selection and short-term sports participation

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The role of growth and maturation during adolescence on team-selection and short-term sports participation

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ABSTRACT

Background: During adolescence, deselection from sport occurs during team try-outs when month of birth, stage of growth and maturation may influence selection. Aim: The purpose of this study was to identify differences in growth and maturity related factors between those selected and deselected in youth sports teams and identify short-term associations with continued participation. Subjects and methods: Eight hundred and seventy participants, aged 11–17 years, were recruited from six sports try-outs in Saskatchewan, Canada: baseball, basketball, football, hockey, soccer and volleyball. Two hundred and forty-four of the initial 870 (28%) returned for follow-up at 36 months. Chronological (years from birth), biological (years from age at peak height velocity [APHV]) and relative (month of birth as it relates to the selection band) ages were calculated from measures of date of birth, date of test, height, sitting height and weight. Parental heights were measured or recalled and participant’s adult height predicted. Reference standards were used to calculate z-scores. Sports participation was self-reported at try-outs and at 36-month follow-up. Results: There was an over-representation of players across all sports born in the first and second quarters of the selection bands (p < 0.05), whether they were selected or deselected. z-scores for predicted adult height ranged from 0.1 (1.1) to 1.8 (1.2) and were significantly different between sports (p < 0.05). Height and APHV differences (p < 0.05) were found between selected and deselected male participants. In females only weight differed between selected and deselected female hockey players (p < 0.05); no further differences were found between selected and deselected female participants. Four per cent of deselected athletes exited sports participation and 68% of deselected athletes remained in the same sport at 36 months, compared with 84% of selected athletes who remained in the same sport. Conclusions: It was found that youth who attended sports team’s try-outs were more likely to be born early in the selection year, be tall for their age, and in some sports early matures. The majority of both the selected and deselected participants continued to participate in sport 36 months after try-outs, with the majority continuing to participate in their try-out sport.

Introduction

According to the 2018 ParticipACTION Report Card on Physical Activity for Children and Youth in Canada, 76% of 11–15-year-olds participated in organised sport (ParticipACTION Canada 2018). Although many young children have the opportunity to participate in inclusive community recreational sports teams, by adolescence team selection becomes less inclusive and relies mostly on selection at team try-outs. Deselection from school sports in Canada begins largely in grade 9 (13–14 years), as high school teams try to remain competitive. Many youth discontinue or quit sport during adolescence, sometimes because of being cut from a sports team (Fraser-Thomas et al. 2008; Gledddie et al. 2019). However, questions have arisen over the lack of due consideration to the potential impact of key growth and maturation processes occurring during adolescence on the selection process (Vaeyeens et al. 2008) and the consequences on sports participation for those deselected from sports teams.

There is a long history of selecting children to sports teams according to chronological age (CA) bands, over either 12 or 24 months (Crampton 1908; Cumming et al. 1972; Goldberg and Biorado 1984; Baxter-Jones 1995; Rogol et al. 2018). For example, an under 15 team will be made up of 13 and 14-year-olds, an under 13 team, 11 and 12-year-olds, etc. The assumption underlying this grouping method is that adolescents of similar ages will be of similar sizes and abilities and will thus receive age-appropriate instruction and be evenly matched in competition (Malina et al. 2019). In practice, this is rarely the case, as a child born within the first
month of a 24-month age band will have up to 23 months more growth and maturation than a child born in the last month of the same age band. This difference of age between individuals in the same age band is referred to as a relative age (RA), and its consequence is known as the relative age effect (RAE) (Musch and Grondin 2001). Concerns have been expressed as to whether CA bands are optimal, or appropriate, for adolescent competition (Baxter-Jones 1995; Rogol et al. 2018), particularly during the years surrounding puberty when children of the same CA can be up to 5 years in difference in biological maturity (e.g. years from age at peak height velocity [APHV]), termed biological age (BA). The idea of using BA rather than CA bands has been termed biobanding (Rogol et al. 2018; Malina et al. 2019).

Advanced BA is accompanied by morphological and physiological advantages in outcomes such as height, weight, heart volume, lung function, aerobic power and muscular strength, to name but a few (Baxter-Jones 1995). Disregarding BA in the process of selection can result in youths being chosen not so much for their skills but for their size and/or fitness in comparison to their teammates; a combination of their genetic potential and their growth and maturity status. The bias found in youth sports, particularly male sports, favouring taller and stronger athletes, means that the individuals with greater biological ages are more likely to be selected on to sports teams (Malina 1994). The greater size and strength of later versus earlier maturing adolescents may mask, or be mistaken for, greater sport-specific skill (Armstrong 2017). In other words, youth sports participants with a later relative age (born later in the selection period) and/or later maturation (younger BA at a given CA) are more likely to be deselected, even if they have the greatest potential for that sport (Malina et al. 2019).

It is unknown if being selected or deselected for a team influences short-term (over 36 months) or even long-term (cessation of involvement in sport over the entire life period) participation in that sport. This is concerning as long-term participation in sport is known to have physical, social and psychological benefits (Stryer et al. 1998; Biddle 2003; Warburton et al. 2006; Moeijes et al. 2019). For example, sports participation and physical activity have been shown to increase positive mood, lower anxiety, increase positive self-perceptions and enhance self-esteem (Biddle 2003; Fox 2003; Veliz and Shakib 2012). Unique to sporting situations is the ability to foster the development of skills in the areas of self-discipline, competitiveness, sportsmanship, leadership, self-confidence and coping with success as well as adversity (Stryer et al. 1998). Child and youth athletes also have higher levels of aerobic power and muscular power and lower body fat than their non-athletic counterparts (Baxter-Jones and Helms 1994), all characteristics that contribute to long-term cardiovascular health. As such there is a need for a better understanding of the role of team selection on continued participation or exit from sport.

Further research on the influences of birth month, growth and maturation on youth sport selection is warranted, as well as the consequences of such selections on future sports participation. Therefore, this study aimed to identify if there were differences in birth month, growth and maturity factors between boys and girls selected and deselected on to provincial sports teams. In addition, the relationship between selection and deselection on continued participation in that sport was investigated. It was hypothesised that those selected would be born early in the selection band, be older and more mature and would be more likely to remain in the sport.

Subjects and methods

Participants

Participants were involved in the Saskatchewan Sports Participation Study (2013–2017). In 2013, through consultation with Sask. Sport Inc., six sporting bodies were recruited: (i) Saskatchewan Hockey Association; (ii) Saskatchewan Soccer Association; (iii) Basketball Saskatchewan; (iv) Baseball Saskatchewan; (v) Saskatchewan Volleyball; and (vi) Football Saskatchewan. Between February 2014 and February 2015 recruitment took place at: (i) male and female hockey Bantam camps (U-15); (ii) male and female high performance development stream soccer camps (U-12, U-13, U-14, and U-15); (iii) male and female basketball provincial team try-outs (U-15); (iv) male baseball bantam selection try-outs (U-15); (v) male and female volleyball high performance programme camps (U-15, U-16, and U-17); and (vi) male Team Saskatchewan Selection camp (U-16). All sporting associations used 31 December as their cut-off dates for age bands.

Recruitment and baseline assessment occurred at the selection camps. The sporting bodies provided lists of names of those selected for teams. Follow-up data were collected at 36 months through online or mailed out questionnaires, or by telephone assisted questionnaires. Thirty-six months was chosen as this was the duration of the funding provided. Individuals who appeared at more than one sport try-out camp were asked to identify their main sport and their data collected at other sport try-outs were excluded.

Data were collected on participant demographics, anthropometrics and parental heights at baseline. At baseline and 36 months the self-report Sports Participation Activities (SPA) questionnaire was administered. Child assent and parental consent were obtained for all participants included in the study and all procedures were approved by the University of Saskatchewan Behavioural Research Ethics Board.

Eight hundred and seventy participants were recruited across all the sports try-outs: 393 hockey players (269 male and 124 female); 138 soccer players (74 male and 64 female); 86 basketball players (51 male and 35 female); 100 volleyball players (35 male and 65 female); 78 male football players; and 75 male baseball players. Athletes were between the ages of 11–17 years at baseline.

Follow-up data was obtained from 28% of the sample at 36 months: 244 subjects, 89 hockey players (50 male and 39 female); 48 soccer players (23 male and 25 female); 27 basketball players (14 male and 13 female); 36 volleyball players (11 male and 25 female); 26 male football players; and 18 male baseball players.
Chronological age

Chronological age (CA) was calculated by subtracting the date of birth from the date at try-out. CA categories were constructed using 1-year intervals from the midpoints of the age; for example, the 10-year age group included participants from 9.50–10.49 years of age.

Biological age

A biological age (BA) was identified by predicting the years from attainment of peak height velocity (PHV). PHV is a somatic maturation milestone found in both males and females. To predict when PHV would occur, a maturity prediction equation from anthropometric measures was used (Mirwald et al. 2002); based on age, sex, height, sitting height and weight. The age from PHV, or maturity offset, estimates how many years the subject is from his or her age-at-PHV. A positive (þ) maturity offset represents the number of years the participant is beyond PHV, whereas a negative (−) maturity offset represents the number of years the subject is prior to PHV. BA categories were constructed using 1-year intervals such that the 1.0 BA category included those with a BA of 1.51 to −0.49.

Relative age

Chronological age cut-offs (month of birth) were identified for each team. Months of birth were quartered for both 12-month and 24-month age bands. For example, if the team used a 12-month age band with a cut-off of 1 January, then the first quartile would contain athletes born between 1 January and 31 March. For a 24-month age band then the first quartile would contain athletes born between 1 January and 30 June of the first year.

Anthropometry

Height, sitting height and weight were collected following the protocols of the International Society for the Advancement of Kinanthropometry (Ross and Marfell-Jones 1991). Using a portable stadiometer (Seca Portable Stadiometer, Hamburg, Germany) height and sitting height were measured in participants, without shoes, holding their heads in the Frankfurt plane, with a precision of 0.1 cm. Body weight (kg) was measured with children in light clothing and with 0.1 kg precision using a portable digital scale (Toledo Scale Company, Thunder Bay, Canada). All measurements were performed twice and a mean calculated; a third measurement was taken if there was a difference of more than 0.1 cm or 0.4 kg. Using reference data from the World Health Organization’s (2014) Canadian data (World Health Organization 2014), each participant’s height and weight were normalised by calculating z-scores.

Parental heights were collected by direct measurement at try-outs or self-report at try-out or via correspondence. Self-report parental heights were corrected for the over-estimation commonly seen when reporting heights using the following equations:

\[
\text{male y} \quad \frac{3}{4} 2.316 \beta 0.955x \quad (1)
\]

\[
\text{female y} \quad \frac{3}{4} 2.803 \beta 0.953x \quad (2)
\]

with \( y \) the adjusted value in inches and \( x \) the self-reported height measurement in inches (Epstein et al. 1995).

Predicted adult height was estimated using (i) mid-parental heights (Tanner et al. 1970):

\[
\text{male } \frac{3}{4} \text{ mothers height} \cdot \text{cm} + 13 \text{ cm}
\]

\[
\beta \text{ fathers height} \cdot \text{cm} = 2
\]

\[
\text{female } \frac{3}{4} \text{ mothers height} \cdot \text{cm} - \beta \text{ fathers height} \cdot \text{cm} - 13 \text{ cm} = 2
\]

and (ii) the Khamis–Roche Method (Khamis and Roche 1994) using the following equation:

\[
\text{Predicted adult stature } \quad \frac{3}{4} b_0 + b_1 \text{ stature } + b_2 \text{ weight } + b_3 \text{ mid parent stature}
\]

where \( b_0 \) is the intercept and \( b_1, b_2 \) and \( b_3 \) are the chronological age grouped coefficients found in the tables reported by Khamis and Roche (1994).

Analyses

The data are expressed as means and standard deviations. Distribution of birth dates by quartiles were investigated by chi-squared goodness of fit tests to assess for bias towards the first quartiles of months of birth, using either 12- or 24-month bands. Independent t-tests and ANOVA were used to determine group differences. Statistical analysis was performed using a commercial software package (SPPS 25, IBM, Armonk, NY). A p-value < 0.05 was considered statistically significant, unless otherwise noted.

Results

When considering the entire sample, more participants were born within the first 2 birth months quartiles (i.e. first 6 months of a 12-month band or first 12 months of a 24-month band) (p < 0.05); graphically displayed in Figure 1 for

![Figure 1. Distribution of birth month quartiles by team selection.](image-url)
selected and deselected participants. In both groups there
was a significant over-representation of the first two birth
month quartiles (p < 0.05). The distributions of birth month
quartiles for each sex, sport and age group are shown in
Tables 1 and 2. Significant skewness in birth month distribu-
tions was found in both selection groups of male hockey
players (p < 0.05), selected football and volleyball players
(p < 0.05) and deselected baseball players (p < 0.05). In
females the only significant differences in birth month distribu-
tions were in both selected and deselected hockey players
(p < 0.05).

Tables 1 and 2 show the means and standard deviations
for growth parameters for males and females, respectively.
Selected male hockey players (Table 1) reached age at PHV
earlier than those who were deselected (p < 0.05) and were
predicted to have a greater adult stature (p < 0.05). Selected
female hockey players (Table 2) had greater weight and pre-
dicted adult stature than deselected players (p < 0.05).
Selected male basketball players were taller, heavier, older,
had taller fathers and had an earlier age at PHV (p < 0.05).
The only difference found in female basketball players was
that selected individual’s fathers were shorter than dese-
lected players’ fathers (p < 0.05). No differences were found
between selected and deselected female soccer players.
Selected male U-15 were younger and shorter than those
deselected (p < 0.05), whereas U-17 selected male volleyball
players were chronologically older, reached PHV earlier and
were taller (p < 0.05) with greater predicted adult stature
(p < 0.05) compared to deselected U-17. Selected U-16 male
volleyball players had earlier predicted age at PHV, were
taller than reference norms and had greater predicted stature
(p < 0.05). No significant differences were found between
selected and deselected female volleyball players try-out
groups (p > 0.05). Selected male baseball and football players
had earlier ages of PHV (p < 0.05) and selected football play-
ners were found to be chronologically older, taller and heavier
(p < 0.05), compared with deselected players.

Thirty-six months after the try-outs it was found that 4%
of the deselected participants no longer participated in any
sport, compared to 1% in the selected group. Of all the par-
ticipants attending try-outs, 81% identified the try-out sport
as their main sport in which they participated. In contrast at
36-month follow-up, 75% of all participants continued to
identify the try-out sport as their main sport. Comparing
between selected and deselected participants at follow-up it
was found that 84% and 68%, respectively, identified the try-
out sport to still be their main sport. Specifically in selected
athletes, participation in their try-out sport had increased at
follow-up compared to try-out, in soccer (96% at 36 months
compared to 84% at baseline), volleyball (90% at 36 months
compared to 75% at baseline), basketball (100% at 36 months
compared to 83% at baseline) and football (57% at 36
months compared to 51% at baseline). In contrast, selected
hockey (86% at 36 months compared to 89% at baseline) and
baseball (33% at 36 months compared to 89% at baseline)
players showed a decrease in the percentage of participants claiming it was their main sport at follow-up
compared to try-outs. In those participants who were
deselected, the percentage identifying their main sport to be the same at follow-up as at try-outs dropped in soccer (79% at 36 months compared to 88% at baseline), volleyball (71% at 36 months compared to 84% at baseline), hockey (79% at 36 months compared to 85% at baseline), basketball (75% at 36 months compared to 76% at baseline) and baseball (13% at 36 months compared to 78% at baseline) but had increased in football (56% at 36 months compared to 31% at baseline).

**Discussion**

This study aimed to identify differences in birth month, growth and maturity factors between individuals selected and deselected on to provincial sports teams at team try-outs. It was found that RAE was present in all of the participants at the initial try-outs, with an over-representation of those born within the first two quartiles of a selection band, regardless of being selected or deselected or the sport being banded by either 12- or 24-months. This RAE phenomenon was also observed in specific sex, sport and age groupings. It was also found that all participants in the sample (both selected and deselected), apart from soccer players, were taller than reference averages for their age. In addition, there was an observed bias in selected male basketball, volleyball and football players in that they were chronologically older, taller and were more mature than deselected players. Chronological age and maturity status did not affect selection in female athletes. Only selected female hockey players demonstrated a size difference from deselected players. These results taken together suggest that both male and females with smaller age related stature, late maturation or whose birth month fell towards the end of the selection period were less likely to participate in team try-out for provincial sports teams; and that selection of more mature, older and larger individuals is sport-specific and more prevalent in male sports.

The continued participation in sport was also investigated, and it was found that a very small percentage of the deselected athletes were no longer participating in sport 36 months after the try-outs. Success at try-outs did not appear to be indicative of continued sports participation.

Maturation is accompanied by significant gains in size, physiological development and thus enhanced performance and the maturity-related gradient of selection/deselection in children’s sports is well documented (Sherar et al. 2007; Malina et al. 2017). For example, advanced maturation has contributed to the selection of male youth soccer players and exclusion of later maturing youth, beginning as early as 12 years of age (Malina et al. 2017). A similar maturational advantage for selection has been observed in elite male and female junior tennis players and male youth hockey players (Sherar et al. 2007; Myburgh et al. 2016). The current findings affirm this same bias in selected male hockey, basketball, U-16 volleyball, baseball and football players who were all determined to have earlier ages of PHV and were, thus, more mature for their CA than their deselected counterparts. Maturation likely contributed to the greater height and/or
weight in selected male football players, basketball and volleyball players. A size advantage, not attributable to advanced maturation, was found in selected female hockey players in the present study who were heavier but did not have a greater BA than deselected players. In contrast, selected male U-15 soccer players were shorter than deselected players. While the theory remains anecdotal, we suggest that this may be because in Saskatchewan, larger children and adolescents are recruited into sports such as football, hockey and basketball, resulting in more skilled smaller soccer players. This may be because soccer has not achieved the same level of popularity in Saskatchewan as other male sports such as hockey. In Europe, where men’s soccer is more popular, the results of team soccer tryouts show similar trends to those of Canadian hockey try-outs (Helsen et al. 2005; Sherar et al. 2007) and current findings for hockey and football.

Other than in female hockey, there were no maturational or size differences identified between selected and deselected female sport participants. One reason why we may not have found a maturity bias in female sports could be because of a lower competitive level of female sports (i.e. not as hard to get selected) or because males tend to be more competitive and motivated to win in a sports setting (Findlay and Bowker 2009; Deane et al. 2016). Alternatively, the maturation-related physiological changes that occur in females (compared with males), such as increased relative fat mass, widening of hips and breast development (Siervogel et al. 2003; Sherar et al. 2011; Barbour-Tuck et al. 2018), may not be conducive to performance and as such, later maturing or younger females may be equally selected as earlier maturing or older females.

A promising alternative to CA banding is bio-banding, an attempt to maturity-match athletes; based on, for example, percentage of adult height attained at try-outs (Malina et al. 2019). This type of maturity-based banding is likely more important in male youth than female youth sports because of the higher prevalence of maturity-based selection in male sport. Bio-banding also has the potential to mitigate the relative age effect (RAE) and the variance in skill within CA bands.

Training competition and selection groupings are often based on specific birth date cut-offs that are used to categorise athletes into 1- or 2-year CA bands. Although the primary purpose is to avoid age differences during competition, children born shortly after the cut-off date are older than the late-born children in the same age band. It has been noted in many sports teams, both youth and professional, that birthdates are heavily skewed towards the beginning of the selection year. Potentially this is because relatively older boys perform at a higher level and because coaches tend to rate players born earlier in the selection year as having greater performance potential (Barnsley and Thompson 1988; Baxter-Jones and Helms 1994; Fumacco et al. 2017; Ibaruz et al. 2018; Figueiredo et al. 2019). Similar to more mature compared to less mature athletes, relatively older compared to relatively younger athletes have already undergone greater morphological and physiological changes, giving them an advantage in characteristics such as size, cardiovascular size and function, respiratory function and muscular strength and power (Baxter-Jones 1995). The current study found a significant bias towards the first two birth month quartiles in selected male football and volleyball players and female hockey players; and that selected male football, basketball and U-17 volleyball players were significantly older than deselected players. Interestingly, the deselected male baseball players had a bias towards the first two quartiles. This may be because baseball is less popular or competitive and has a much shorter season in Saskatchewan than, for example, hockey, which has previously demonstrated strong bias towards older and more mature individuals (Sherar et al. 2007). Those participants who were selected for baseball may have been unsuccessful in hockey early on and thus became more committed to skill acquisition in baseball. Again, there were no differences observed between selected and deselected females, with the exception of hockey players. This may be due to the timing of maturational and age-related changes in females. Almost all of our female athletes were over the age of 12 (and most over the age of 14), an age when most females will have gone through peak height velocity (PHV) and other advantageous physiological changes, resulting in homogeneity of age- and maturity-related attributes between selected and deselected groups.

In the current study, it was also found that there was bias towards the first two birth month quartiles when sports, sex and selected/deselected data were aggregated. This suggests that by the time of adolescent try-outs for provincial sport teams, RAE had likely already had a profound effect on youth sport participation. In other words, individuals with an early birth date quartile had already been preferentially selected or self-selected for previous teams, contributing to an over-representation in the current adolescent sample. For example, club soccer players in Saskatchewan are separated into ‘Premier’, ‘Division II’ and ‘Division III’ teams as early as U-11 (9 and 10 years of age). Either by coach-, parental- or self-selection, it is most likely that only those in the Premier and Division II league would attend a provincial try-out.

Time is the great equaliser and earlier maturation or advanced age that presents as greater size in adolescents does not predict greater final adult height (Vizmanos et al. 2001). Only female hockey and male hockey players and male basketball players in the current cohort are likely to have greater final adult stature, as indicated by greater predicted adult stature and greater paternal height, respectively.

The physical and psychosocial benefits of sport involvement are well recognised (Baxter-Jones and Helms 1994; Biddle 2003; Fox 2003; Veliz and Shakib 2012). However, the large dropout rates from sports programmes during adolescence has been identified by sports psychologists as an area of concern (Fraser-Thomas et al. 2008; Gleddie et al. 2019). Although numerous situational factors (e.g. lack of playing time, program seriousness, motivation, etc.) have been cited among youth’s reasons for dropout (Gould et al. 1982), level of maturation is also known to contribute to dropout decisions, as does the result of being cut from a team (Fraser-Thomas et al. 2008). The physical effects for athletes who
had been cut from a team seem largely dependent on whether or not the individual remained an athlete (Blinde and Stratta 1992). It is noted that deselected athletes rarely try-out the following school year for the same team they were cut from and that being cut deterred athletes from trying out for future teams in any sport (Gleddie et al. 2019). This has also been observed that physical activity levels decrease in students who have been cut (Gleddie et al. 2019). These observations were not replicated in the present study. Two-thirds of deselected subjects continued to be involved in the same sport, 36 months after team deselection, with the majority of the other third changing sport. Only 4% of the deselected subjects were no longer involved in any sport at 36-month follow-up. Although exiting from sport was not an issue in the present study, the myriad benefits of sport participation suggests that those working with youth and youth athletes should concern themselves with caring for and supporting the physical, emotional and social well-being of their charges (Gleddie et al. 2019). Those who are cut from teams should be encouraged to continue participation in sport in some capacity.

Limitations and future direction

This study is unique in its survey of a diverse set of sports, the inclusion of males and females and the 36-month follow-up, adding important information about the contributors and consequences of selection and deselection from a sports team. There are, however, limitations to the study. The majority of the female participants were maturationally homogenous, being past the age of menarche and PHV, making maturational comparison difficult. Similarly, individuals trying out for provincial teams are likely to already be elite, contributing to the homogeneity of the sample in terms of skills, abilities, maturation and sports experience. Future studies wishing to examine the influence of maturation in female sport selection should recruit individuals before the age of pubertal onset and the time at which tiered selection begins. Finally, while the overall sample size for the study was large, once split into sport, sex and selection groups each sample became much smaller, making it harder to find statistical significance between group means. The smaller sport-specific sample sizes also question the generalizability of the findings and the ability to make inferential conclusions.

Conclusions

The findings from this large and sports-diverse cohort study suggest that there is a selection bias towards more mature and larger individuals. This result varied by sport and sex, being more common in males and more specific to football, hockey, basketball and volleyball than soccer and baseball. Furthermore, this bias appears to begin prior to the age of 11 years when provincial level try-outs start. This suggests that those attending try-outs are already a bias homogenous sample and this may explain in part why selection had relatively little effect on sports participation 36 months later. Coaches should be aware that try-out participants show a bias in favour of being born within the start of the selection age band and are likely older, taller and more mature than individual who chose not to attend selection try-outs.

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