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The Influence of Relative Age on Developmental Outcomes in Female Ice Hockey

By

Laura Chittle

A Dissertation
Submitted to the Faculty of Graduate Studies
through the Department of Kinesiology
in Partial Fulfillment of the Requirements for
the Degree of Doctor of Philosophy
at the University of Windsor

Windsor, Ontario, Canada

2020

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The Influence of Relative Age on Developmental Outcomes in Female Ice Hockey

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DECLARATION OF CO-AUTHORSHIP / PREVIOUS PUBLICATION

I. Co- Authorship

I hereby declare that this thesis incorporates material that is the result of joint research, as follows: Chapter 2, Chapter 3 and Chapter 4 were co-authored with Dr. Jess C. Dixon and Dr. Sean Horton. The key ideas, primary contributions, data collection, data analysis, interpretation, and writing were performed by Laura Chittle, and the contribution of co-authors was primarily through the provision of critical feedback to enhance the quality of the research.

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I certify that, with the above qualification, this thesis, and the research to which it refers, is the product of my own work.

II. Previous Publication

This dissertation includes three original papers that have been previously published/submitted for publication in peer reviewed journals, as follows:

| Chapter | Publication title/full citation | Publication status* |
|-----------|---|---------------------|
| Chapter 2 | Chittle, L., Horton, S., & Dixon, J. C. (in press). Examining the role of relative age on leadership behaviors among female ice hockey players: An exploratory investigation. <i>Journal of Amateur Sport</i> . | In-press |

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| Chapter 3 | Chittle, L. Dixon, J. C., & Horton, S., (2019). Youth developmental experiences among female hockey players: The role of relative age. <i>Journal of Youth Development, 14</i> (4), 83-100. | Published |
| Chapter 4 | Chittle, L., Horton, S., & Dixon, J. C. (Submitted). The impact of relative age on positive youth development among female ice hockey players: A qualitative examination. <i>Journal of Adolescent Research.</i> | Submitted |

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ABSTRACT

When properly structured, sport has the capacity to offer athletes numerous positive outcomes. However, the seemingly simple procedure of dividing athletes by chronological age causes relative age disparities which are associated with varying sporting experiences and opportunities for participation. Relative age effects (RAEs) are developmental (dis)advantages associated with an individual's birthdate and where that falls relative to a pre-determined cut-off date. The objective of this dissertation was to explore differences in positive youth development (PYD) across the relative ages of female ice hockey players, as well as to determine if the mechanisms that contribute to athletes' acquisition of PYD differed by relative age. This aim was accomplished through three interrelated studies. In Chapter 2, differences in leadership behaviours were examined while accounting for athletes' relative age. The findings of this study illustrated that the frequency with which female ice hockey players engage in leadership behaviours did not vary by relative age, supporting prior research in male ice hockey. Chapter 3 expanded the investigation of relative age on PYD by exploring how positive and negative developmental experiences differ by athletes' relative ages. The results of this study showed that relative age was not a differentiating factor in female ice hockey players' developmental experiences. Thus, the findings from Chapters 2 and 3 suggest that if female ice hockey players can overcome the initial selection bias associated with relative age, then their opportunities for PYD appear to be equitable. Chapter 4 builds on Chapters 2 and 3 by including interviews with relatively older and younger female ice hockey players that sought to gain insight

into what mechanisms contributed or hindered their development of PYD outcomes. Secondary aims included determining if PYD outcomes varied by relative age as well as how athletes employed these skills in other contexts. The social features of the sport environment, the structure of female travel/rep ice hockey, and negative ice hockey experiences (e.g., difficult team dynamics, challenges with coaches, playing on boys' teams) served as the overarching mechanisms that facilitated or hindered athletes' development of PYD outcomes. Regardless of their relative age, athletes reported developing PYD outcomes in the personal, physical, and social domains as well as using these skills in many contexts outside of hockey. Future research is needed to explore if relative age influences PYD among those who have dropped out of sport. The findings from this dissertation can be used to inform the design of sport programming that aims to achieve PYD.

DEDICATION

To my husband, for your encouragement and support.

*To my parents, for everything you have done to help me get here, and all that you
still do for me.*

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To Sean and Jess, I cannot thank you enough for the last eight years that you have spent teaching me. Thank you for your unwavering support, mentorship, and the time you invested in my academic and professional development.

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CHAPTER 1

INTRODUCTION

Baker and Horton (2004) proposed that primary (e.g., genetic, training, and psychological factors) and secondary (e.g., socio-cultural and contextual elements) factors influence skill acquisition and the attainment of sport expertise. Relative age is an important secondary factor that can constrain athlete development (Wattie, MacDonald, & Coble, 2015). Relative age differences among individuals emerge as a result of the prevalent policies employed by sport and educational systems to group individuals based upon their chronological age (Baker, Schorer, & Coble, 2010; Musch & Grondin, 2001; Vincent & Glamser, 2006). While this may be a benevolent attempt to ensure equal competition, safety, and age-appropriate instruction (Barrow & McGee, 1971; Musch & Grondin, 2001), such practices lead to variability within ages among individuals grouped together, which can result in selection and attainment (dis)advantages. For example, among 10-year-old children, an 11-month age difference represents 10% of total life experience (Musch & Grondin, 2001). Relative age effects (RAEs) describe these relative (dis)advantages experienced by individuals grouped within the same age cohort and can be characterized by a negative linear relationship between participation rates and month of birth (Barnsley, Thompson, & Barnsley, 1985).

Sport has drawn considerable attention from the RAE research community, with authors demonstrating a persistent discriminatory effect (e.g., Hurley, Lior, & Tracze, 2001) in a range of sports (e.g., soccer and ice hockey) and across a number of age categories (Coble, Baker, Wattie, & McKenna, 2009a; Smith, Weir, Till, Romann, & Coble, 2018). Given that sport can be an excellent structured activity for youth to

develop psychosocial and motor skills, as well as physical health (Côté & Fraser-Thomas, 2011), the wide-spread presence of RAEs is concerning, particularly for those who advocate for the benefits of sport participation being made equally available. On average, relatively older athletes are chosen more often for travel/rep teams, which may provide better coaching, more practice and play time, and greater competition (Barnsley, Thompson, & Legault, 1992; Helsen, Starkes, & Van Winckel, 1998), allowing them to reap the rewards of sport participation.

Sport is an organized activity that can foster initiative – a core requirement for other developmental skills (e.g., leadership, altruism; Larson, 2000). When appropriately structured, sport can facilitate a number of positive outcomes within personal, social, and physical domains (Holt et al., 2017). As such, the benefits of sport participation ought to be available to everyone; however, there is a growing body of literature suggesting those who are relatively younger more frequently drop out of sport and therefore, may miss opportunities for positive participatory outcomes (e.g., Barnsley & Thompson, 1988; Delorme, Boiché, & Raspaud, 2010a; Delorme, Boiché, & Raspaud, 2010b; Delorme, Chalabaev, & Raspaud, 2011; Helsen et al., 1998; Lemez, Baker, Horton, Wattie, & Weir, 2014). Moreover, there is evidence of RAEs emerging in sport as young as five years of age when team selections do not exist and physical size is unimportant (Hancock, Ste-Marie, & Young, 2013). This illustrates that parents (as social agents) are more inclined to enrol their relatively older children in sport at earlier ages, which offers additional developmental opportunities that can persist throughout their sporting careers (Hancock, Adler, & Côté, 2013). It appears that disparities in relative age can lead to

participatory advantages and potentially more negative sporting experiences for younger athletes.

Causes of RAEs

Several mechanisms have been proposed as causes of the RAE (Baker, Schorer, et al., 2010). In their comprehensive review, Musch and Grondin (2001) hypothesized four contributing factors to the RAE: competition, physical development, psychological factors, and experience. In order for RAEs to emerge, there must be competition among athletes for positions on teams. Within recreational sport, where there is no coach selection process, RAEs are far less common (e.g., Chittle, Horton, Weir, & Dixon, 2017a; Hancock, Ste-Marie, et al., 2013) than representative leagues where the relatively oldest are more often selected for teams (e.g., Barnsley & Thompson, 1988; Montelpare, Scott, & Pelino, 2000; Nolan & Howell, 2010). Competition for roster positions on elite teams may also be influenced by sport popularity (e.g., Baker, Schorer, Copley, Bräutigam, & Büsch, 2009; Copley et al., 2009a; Dixon, Horton, & Weir, 2011). Furthermore, physical size and psychological maturity can accelerate RAEs as coaches more commonly select physically precocious athletes (e.g., Andronikos, Elumaro, Westbury, & Martindale, 2016; Barnsley et al., 1985; Helsen et al., 1998). Conversely, relatively younger (and often less developed) athletes more frequently experience frustration and negative sporting environments (Barnsley & Thompson, 1988). Finally, relative age differences can contribute to more active sport participation, leading to increased training. This additional training can lead to accumulated advantages for relatively older individuals that persist over time (Dixon et al., 2011).

Another prominent explanation of the RAE in the literature includes the ‘selection-maturation’ hypothesis (Cobley et al., 2009a; Lovell et al., 2015; Romann & Cobley, 2015), which suggests that greater chronological age is associated with advantageous anthropometric and physical attributes (Lovell et al., 2015; Romann & Cobley 2015; Smith et al., 2018). These favourable characteristics can lead to coaches being biased towards selecting relatively older athletes (e.g., Carling, le Gall, Reilly, & Williams, 2009; Sherar, Baxter-Jones, Faulkner, & Russell, 2007). Within representative soccer, it has been suggested that when relatively younger athletes are selected, they are typically similar in physical maturity to their relatively older peers (e.g., Hirose, 2009; Lovell et al., 2015). Similarly, Baker, Cobley, et al. (2010) found a RAE present among Atom ice hockey players; however, there were no differences in weight and height between birth quartiles¹, suggesting that coaches select a physically homogenous group of athletes who are developmentally mature. Furley and Memmert (2016) provided further support for the selection-maturation hypothesis when they concluded that coaches automatically associate sport giftedness with physical size. This suggests that giftedness may be implicitly grounded in perceptions of physicality. Such selection bias is particularly concerning given that it can lead to higher quality training and coaching (Helsen et al., 1998). To complicate matters, RAEs are moderated by a series of factors such as sex, age/stage of career, playing position, and handedness (Baker, Schorer, et al., 2010). As a result, it has proven challenging for researchers to develop frameworks that

¹ A quartile refers to when the calendar year is separated into four (more/less) equal divisions. When using January 1st as the cut-off point, Quartile 1 consists of January, February and March, Quartile 2 includes April, May and June, Quartile 3 represents July, August and September, and Quartile 4 encompasses October, November and December.

encompass all the complexities and idiosyncrasies that are associated with RAEs across various sports and competitive levels.

Theoretical Frameworks of the RAE

Despite the large quantity of empirical studies describing the existence or absence of RAEs, the field has been criticized for being atheoretical (Cobley et al., 2009a; Hancock, Adler, et al., 2013; Wattie, Schorer, & Baker, 2015). This is likely the result of the scant theoretical frameworks available to describe the nuances and complexities of RAEs within sport (Wattie, Schorer, et al., 2015). In an attempt to address this lack of theory, Hancock, Adler, et al. (2013) and Wattie, Schorer, et al. (2015) created two models to explain the RAE in sport.

Social Agents Model

Hancock, Adler, et al. (2013) proposed a social agents model to explain the creation, perpetuation, and strengthening of RAEs in sport. Parents, coaches, and athletes have been proposed as three primary social agents that amplify or mitigate RAEs through ‘*Matthew Effects*’ (Merton, 1968), ‘*Pygmalion Effects*’² (Rosenthal & Jacobson, 1968), and ‘*Galatea Effects*’ (Merton, 1957), respectively. Matthew Effects (Merton, 1968) describe circumstances where individuals have initial advantages that grow over time, while others who are initially disadvantaged become increasingly disadvantaged (Hancock, Adler, et al., 2013; Hancock & Côté, 2014). With respect to relative age research, relatively older individuals are typically advantaged, while those relatively

² Despite the criticisms of Rosenthal and Jacobson’s (1968) work (e.g., Elashoff & Snow, 1971), it is a seminal paper for the concept of Pygmalion effects and is relevant to framing the social agents model (Hancock, Adler, et al., 2013).

younger are often disadvantaged. Parents facilitate Matthew Effects through their decisions to enroll their children into sport (or not). Early enrollment in sport can enable children to develop skill advantages over their peers who begin sport participation in later years (Hancock, Adler, et al. 2013). For example, Hancock, Ste-Marie, et al. (2013) witnessed traditional RAEs among Initiation (ages 5-6) male ice hockey players, suggesting an initial enrolment bias. This initial advantage afforded to relatively older children cannot be explained by coaches as the Initiation program does not involve coach selections. Therefore, the Matthew Effect has been traced back to parents of relatively older children being more inclined to enroll their children into ice hockey than parents of relatively younger children.

Pygmalion and Galatea Effects are considered self-fulfilling prophecies (Merton, 1948), whereby a false belief leads to a change in behaviour resulting in the false belief becoming true (Hancock, Adler, et al., 2013; Hancock & Côté, 2014). Pygmalion Effects occur when coaches perceive physically larger athletes (often relatively older) as more talented and select these individuals for teams. Once selected, these athletes may receive more instruction and playing time. As an example, Sherar et al. (2007) found coaches were significantly more likely to select taller and heavier Bantam ice hockey players for a provincial team and noted significant differences across quartiles for height and weight.

Galatea Effects describe how expectations placed on athletes can lead them to align their behaviours with those expectations. Within sport, parents and coaches offer external expectations, often grounded in perceptions of size and maturity rather than skill, which can influence the internal expectations and behaviours of athletes (Hancock, 2020). For example, relatively older athletes who are selected for a team may believe this

is the result of superior skill, rather than physical size. This may lead them to have higher self-expectations and greater commitment and training, which could ultimately cause them to become better relative to their peers (Hancock, Adler, et al., 2013). The collective influence of these social agents who interpret the mechanisms associated with RAEs (e.g., maturity, skill) are believed to influence the creation and accumulation of RAEs over time.

Developmental Systems Model

Wattie, Schorer, et al. (2015) argued that the complexity of the RAE is not captured completely through three social agents (Hancock, Adler, et al., 2013) and suggested that a sport-specific model may be better suited to frame the multifaceted nature of sport participation and development. Based on the underpinnings of Newell's (1986) Model of Constraints, Wattie, Schorer, et al. (2015) created a developmental systems model featuring three interacting constraints that can influence the existence of RAEs in various circumstances: individual constraints (e.g., birth date, sex, handedness), task constraints (e.g., participation level, playing position, physicality of sport), and environmental constraints (e.g., coach influence, family influence, age and other grouping policies). Individual constraints describe factors that relate to human qualities and include both structural and functional factors. Sex is an important individual constraint as it has been considered a moderator of the RAE (e.g., Baker, Schorer, et al., 2010; Wattie, MacDonald, et al., 2015). Furthermore, RAE patterns in female sport have been non-linear (e.g., Baker et al., 2009; Delorme et al., 2010a; Smith et al., 2018; Weir, Smith, Paterson, & Horton, 2010) compared to the traditional profile seen in male sport (e.g., Hancock, Ste-Marie, et al., 2013). Task constraints include the demands and rules of the

sport. For example, RAEs have been found in competitive ice hockey (e.g., Barnsley & Thompson, 1988; Boucher & Mutimer, 1994; Delorme Boiché, & Raspaud, 2009), but not within house league ice hockey (e.g., Chittle et al., 2017a; Montelpare et al., 2000), illustrating that participation level can influence the existence of RAEs. Environmental constraints include “the broader social constructs that affect development, including the physical environment, socio-cultural environment, polices, and the influence of important actors in athletes’ lives, such as coaches, family and friends” (Wattie, Schorer, et al., 2015, p. 84). With respect to environmental constraints, the age grouping polices imposed by a sport organization can contribute to the presence/absence of RAEs. For example, in sports where categorization is based upon anthropometric measurements (e.g., boxing), RAEs typically do not occur (e.g., Andronikos et al., 2016; Delorme, 2014). A strength of Wattie, Schorer, et al.’s (2015) developmental systems model is that it recognizes that different sport circumstances require unique constraint profiles, and that the contribution of each constraint type may differ depending on the situation or system.

Brief History of RAEs in Ice Hockey

Ice hockey and volleyball were the first sports to be explored for RAEs, where unequal birth distributions were seen among Canadian ice hockey players and male and female volleyball players participating at the recreational, competitive, and senior professional levels (Grondin, Deshaies, & Nault, 1984). Shortly thereafter, Barnsley and colleagues provided strong evidence of RAEs within the National Hockey League (NHL), Western Hockey League, and Ontario Hockey League, and in top tier adolescent ice hockey (Barnsley & Thompson, 1988; Barnsley et al., 1985). Since these foundational studies, RAEs have been found consistently among professional ice hockey (e.g., Addona

& Yates, 2010; Côté, MacDonald, Baker, & Abernethy, 2006; Nolan & Howell, 2010) and youth representative players (e.g., Boucher & Mutimer, 1994; Hancock, Ste-Marie, et al., 2013; Turnidge, Hancock, & Côté, 2014). The RAE is so strong throughout youth ice hockey that Barnsley and Thompson (1988) suggested that “...professional hockey players are really drafted when they are nine years old, at the time when they are selected for the top tier leagues in their age group” (p. 175). Relative age effects are often witnessed in popular and culturally relevant sports (Musch & Grondin, 2001), so it is not surprising that these effects are strong within North American ice hockey contexts.

Cobley et al.’s (2009a) meta-analysis indicated that the vast majority of RAE studies to that point examined males, with only 2% of samples consisting of females, perhaps due to the lower value society places on women’s sport (Weir et al., 2010). Since this time, more attention has been given to studying female sport and a recent meta-analysis targeted the systematic evaluation of RAEs across female contexts (Smith et al., 2018). The overarching results of this analysis of female athletes indicated that the RAE magnitude is greatest among pre-adolescent and adolescent age categories, within team sports, and in competitive sport. Of the 25 sports examined in this study, ice hockey had the fourth strongest RAE.

With respect to women’s ice hockey, no RAE was seen among Canadian national championship players (Wattie, Baker, Cobley, & Montelpare, 2007); however, when this sample was expanded upon to include national and international players, a RAE was found, with an overrepresentation of athletes born in quartile two (Weir et al., 2010). At the interuniversity level, a similar significant atypical RAE pattern exists (i.e., peak in quartile two; Chittle, Horton, & Dixon, 2015). Similarly, Stenling and Holmström (2014)

found RAEs among elite and junior elite Swedish women's ice hockey players but the RAE profile corresponded to a more traditional pattern characterized by a linear decline from quartiles one through four.

Within developmental girls' ice hockey, RAEs have been consistently demonstrated across both pre-and-post pubescent age categories (Hancock, 2017; Hancock, Seal, Young, Weir, & Ste-Marie, 2013; Smith & Weir, 2013; Stenling & Holmström; 2014). Generally, effect sizes decrease with age and in nearly every age cohort quartile two was the most over-represented and quartile four was the most under-represented (Hancock, 2017; Hancock, Seal et al., 2013; Smith & Weir, 2013). While this non-linear RAE trend has been illustrated in other female sport contexts (e.g., Baker et al., 2009; Delorme et al., 2010a), there continues to be a sense of uncertainty as to what causes this unique pattern. Hancock (2017) concluded that this second-quartile phenomenon is not the result of the relatively oldest female players competing in male ice hockey, as the atypical pattern was also evident among females playing on male hockey teams. Other possible explanations include those born in quartile one being more likely to participate in traditionally stereotyped female sports (Hancock, Seal, et al., 2013) or, because female ice hockey restricts the use of body checking, it is possible that coach selection is less based on maturity and more focused on skill (Hancock, 2017).

As demonstrated in the literature, women's ice hockey at both the developmental and elite levels tend to support the presence of a RAE. This may be due, in part, to the considerable growth in the number of registrants over the last 25 years (Hockey Canada, n.d.; Hockey Canada, 2019), which has increased competition for positions on teams. Specifically, within the 1993-1994 season there were only 7,743 females registered in ice

hockey (Hockey Canada, n.d.) compared to 102,959 females registered to play hockey in 2018-2019, with Ontario comprising 50,723 of these registrants (Hockey Canada, 2019). This growth in the number of female ice hockey players, along with the persistent RAE, makes it a fruitful avenue for exploring the experiences of relatively younger and older female ice hockey players and possible consequences of RAEs.

This dissertation targets post-pubescent female ice hockey players (15-18 years of age). While the strength of RAEs generally decrease with age (Smith et al., 2018), I intentionally selected this age range because it has consistently demonstrated a RAE (e.g., Hancock, 2017; Smith & Weir, 2013). Within the context of ice hockey, Hancock's (2017) analysis of Ontario Hockey Federation players found the strength of the RAE among Midget players ($w = 0.13$) was similar to Bantam players ($w = 0.14$). Selecting a post-adolescent sample allows for the examination of *how* relatively younger athletes are able to maintain their participation in competitive ice hockey despite being at a relative age disadvantage when they entered the developmental sport system. Such insights may expand our understanding of 'RAE reversals' in a female, non-elite context. Furthermore, selecting a post-adolescent sample increases the likelihood of participants acquiring a range of different sport experiences across their lifespan, in addition to having the ability to coherently reflect on these experiences and communicate them in a meaningful way. For feasibility purposes, participants were recruited from various competitive levels (e.g., AA, A, and BB) where 'A' categories generally represent higher levels of ice hockey. Please see Appendix A for a description of the researcher's role in shaping this dissertation.

RAEs and Positive Youth Development

The importance of examining the RAE from a macro and micro approach has been noted in the literature. Micro approaches may include the study of psychosocial measures related to athlete performance (Wattie et al., 2015). Much of the RAE research has focused on participatory (dis)advantages caused by relative age disparities (e.g., Cobley et al., 2009a; Smith et al., 2018) or how individual, task, and environmental constraints impact RAE patterns (e.g., Hancock, Ste-Marie, et al., 2013; Schorer, Cobley, Büsch, & Baker, 2009; Schorer, Wattie, & Baker, 2013; Sherar et al., 2007). However, to date, few studies have considered the broader implications of RAEs to human development, particularly positive youth development (PYD). Positive youth development describes “strength-based and asset-building approaches to developmental research in which youth are viewed as ‘resources to be developed’ rather than ‘problems to be solved’” (Holt, Sehn, Spence, Newton, & Ball, 2012, p. 98). Those who experience PYD engage in prosocial behaviours that benefit themselves, parents, peers, the community, and society (Sullivan, LaForge-MacKenzie, & Marini, 2015) and avoid health-compromising and future-jeopardizing behaviours (Roth, Brooks-Gunn, Murray, & Foster, 1998). Organized sport is considered an optimal environment to foster PYD (Fraser-Thomas, Côté, & Deakin, 2005); thus, it is critical that all youth have an equal opportunity to pursue sport and experience a supportive social environment including life skill building activities believed to foster PYD (Holt et al., 2017).

There are several frameworks available to assess PYD, including Lerner’s ‘Five Cs,’ consisting of caring, connection, character, confidence, competence (Lerner, Fisher, & Weinberg, 2000), and Larson’s domains of learning experiences (Dworkin, Larson, &

Hansen, 2003; Larson, Hansen, & Moneta, 2006). However, neither of these approaches were developed within a sport context. Sport-specific approaches to PYD include the *Framework for Planning Youth Sport Programs* (Petitpas, Cornelius, Van Raalte, & Jones, 2005), the *Personal Assets Framework* (Côté, Turnnidge, & Evans, 2014; Côté, Turnnidge, & Vierimaa, 2016), the *Applied Sport-Programming Model of Positive Youth Development* (Fraser-Thomas et al., 2005), and *A Model of Coaching Life Skills through Sport* (Gould & Carson, 2008). Through a qualitative meta-analysis, Holt et al. (2017) offered the most comprehensive model of PYD through sport. This model recognizes PYD outcomes can be developed implicitly through the PYD climate (adult relationships, peer relationships, and parental involvement) and explicitly through a life skills program focus (life skill building activities and transfer activities). Characteristics of individuals (e.g., socio-demographic factors, traits, and dispositions) can also influence their attainment of PYD outcomes (Holt et al., 2017). Strengths of this model include the robust synthesis of PYD literature, a description of how learning occurs within sport programs, as well as including testable hypotheses. Existing research has found no differences in developmental experiences (Chittle, Horton, Weir, & Dixon, 2017b; Hancock, 2016; Wattie, Sornberger, & Fraser-Thomas, 2018) or leadership behaviours across relative age (Chittle et al., 2017a). However, these previous studies focused on male sport, included a wide age range of participants, or analyzed multiple sports collectively. Therefore, missing from the current body of literature is an understanding of the implications of relative age on PYD within female sport. Insights gained from such investigations may help inform the creation and/or adaptations of RAE and PYD models.

Inconsistencies in attainment outcomes as a result of relative age were first recognized within education (Armstrong, 1966; Freyman 1965). Subsequent research has found that relatively younger students earn lower grades in multiple disciplines (e.g., math, science), have poorer school attendance rates, have higher learning support referrals (Cobley, McKenna, Baker, & Wattie, 2009b), and are more commonly misdiagnosed with Attention Deficit Hyperactivity Disorder (Elder, 2010). Relative age has been found to influence the attainment of psychosocial skills such as leadership, where relatively older high school classmates more commonly hold leadership roles (e.g., team captain, club president) and accumulate approximately 5% more leadership experience prior to graduation than their relatively younger peers (Dhuey & Lipscomb, 2008). With respect to long-term outcomes, relatively older individuals are more likely to attend post-secondary school (Bedard & Dhuey, 2006; Dhuey, Figlio, Karbownik, & Roth 2017) and less likely to be incarcerated for juvenile crime (Dhuey et al., 2017). Clearly, those who are relatively younger experience both short and long-term disadvantages more often than their relatively older peers (Thompson, Barnsley, & Dyck, 1999).

Overview of the Proposed Research Studies

The overarching purpose of this dissertation was to address a gap in the RAE literature by exploring the implications of relative age on PYD. This was achieved through three interrelated research studies. Chapters 2 and 3 include investigations of the impact of relative age on PYD outcomes among female ice hockey players. Specifically, Chapter 2 focused on whether self-reported leadership behaviours (as measured by the Leadership Scale for Sport; Chelladurai & Saleh, 1980) would vary by relative age

among competitive female ice hockey players. Expanding on this line of inquiry, Chapter 3 contains an investigation of how positive and negative developmental experiences³ measured using the Youth Experiences Survey for Sport (YES-S; MacDonald, Côté, & Deakin, 2012) may differ by relative age. Together, these studies provide insights into the broader implications of the RAE beyond sport participation rates and examined whether relatively younger and older athletes have different developmental experiences in sport. Building on the findings from Chapter 2 and 3, Chapter 4 consists of a qualitative study that aimed to understand the mechanisms that contributed to relatively younger and older athletes' acquisition of PYD outcomes. Secondary aims were to determine if PYD outcomes varied by relative age as well as how athletes were employing these skills in different contexts.

This dissertation contributes to the existing body of research by expanding our understanding of the RAE within female sport (Smith et al. 2018), as there are still comparatively fewer studies of female athletes than male athletes. Furthermore, fewer than five studies have relied on qualitative methodologies or have examined the impact of relative age on human development, particularly PYD. If sport is considered an optimal activity to foster physical health, psychosocial and motor skills (Côté & Fraser-Thomas, 2011), then it is critical that we understand the unique experiences that athletes are having in sport, as well as the factors that are impacting these experiences. This dissertation examines the influence RAEs may have on the developmental experiences of

³ The YES-S is a measurement tool to evaluate positive and negative developmental experiences in sport (MacDonald et al., 2012) and is considered a psychometric tool used to measure the construct PYD (Sullivan et al., 2015). The YES-S measures specific PYD outcomes; however, Holt et al.'s model of PYD through sport recognizes additional outcomes that are indicative of PYD. While leadership is considered a PYD outcome (Holt et al., 2017), it is not formally measured by the YES-S.

female ice hockey players and utilizes a qualitative methodology to understand important mechanisms that underly PYD while considering relative age. The goal of these studies is to understand the rich experiences female ice hockey players are having, inform the creation of sport environments, and develop new areas for future research. This dissertation provides a foundation for future studies to examine how relative age could influence other psychosocial constructs related to sport performance and highlights key social and structural factors to consider when designing youth sport programming to facilitate PYD.

REFERENCES

- Addona, V., & Yates, P. A. (2010). A closer look at the relative age effect in the National Hockey League. *Journal of Quantitative Analysis in Sports*, 6(4), 1-17.
- Andronikos, G. Elumaro, A. I., Westbury, T., & Martindale, R. J. J. (2016). Relative age effect: Implications for effective practice. *Journal of Sports Sciences*, 34, 1124-1131.
- Armstrong, H. G. (1966). A comparison of the performance of summer and autumn-born children at eleven and sixteen. *British Journal of Educational Psychology*, 36(1), 72-76.
- Baker, J., & Horton, S. (2004). A review of primary and secondary influences on sport expertise. *High Ability Studies*, 15(2), 211-228.
- Baker, J., Schorer, J., & Cogley, S. (2010). Relative age effects: An inevitable consequence of elite sport? *Sportwissenschaft*, 40(1), 26-30.
- Baker, J., Schorer, J., Cogley, S., Bräutigam, H., & Büsch, D. (2009). Gender, depth of competition and relative age effects in team sports. *Asian Journal of Exercise & Sports Science*, 6(1), 1-7.
- Barnsley, R. H., & Thompson, A. H. (1988). Birthdate and success in minor hockey: The key to the NHL. *Canadian Journal of Behavioural Science*, 20(2), 167-176.
- Barnsley, R. H., Thompson, A. H., & Barnsley, P. E. (1985). Hockey success and birthdate: The RAE. *Canadian Association for Health, Physical Education, and Recreation*, 51, 23-28.

- Barnsley, R. H., Thompson, A. H., & Legault, P. (1992). Family planning: Football style. The relative age effect in football. *International Review for the Sociology of Sport*, 27(1), 77-86.
- Barrow, H. M., & McGee, R. (1971). *A practical approach to measurement in physical education*. Philadelphia, PA: Lea & Febiger.
- Bedard, K., & Dhuey, E. (2006). The persistence of early childhood maturity: International evidence of long-run age effects. *The Quarterly Journal of Economics*, 121(4), 1437-1474.
- Boucher, J. L., & Mutimer, B. T. (1994). The relative age phenomenon in sport: A replication and extension with ice-hockey players. *Research Quarterly for Exercise and Sport*, 65(4) 377-381.
- Carling, C., le Gall, F., Reilly, T., & Williams, A. M. (2009). Do anthropometric and fitness characteristics vary according to birth date distribution in elite youth academy soccer players? *Scandinavian Journal of Medicine & Science in Sports*, 19, 3-9.
- Chelladurai, P., & Saleh, S. D. (1980). Dimensions of leader behavior in sports: Development of a leadership scale. *Journal of Sport Psychology*, 2, 34-45.
- Chittle, L., Horton, S., & Dixon, J. C. (2015). Exploring the relative age effect in Canadian interuniversity ice hockey. *Talent Development & Excellence*, 7(1), 69-81.

- Chittle, L., Horton, S., Weir, P., & Dixon, J. C. (2017a). Investigating the relationship between the relative age effect and leadership behaviors among male ice hockey players. *International Review for the Sociology of Sport*, 52(6), 751-768.
- Chittle, L., Horton, S., Weir, P., & Dixon, J. C. (2017b). Exploring the relationship between relative age effect and youth development among male recreational ice hockey players. *Journal of Amateur Sport*, 3(1), 79-95.
- Cobley, S., Baker, J., Wattie, N., & McKenna, J. M. (2009a). Annual age-grouping and athlete development: A meta-analytic review of relative age effects in sport. *Sports Medicine*, 39(3), 235-256.
- Cobley, S., Baker, J., Wattie, N., & McKenna, J. M. (2009b). How pervasive are relative age effects in secondary school education? *Journal of Educational Psychology*, 101(2), 520- 528.
- Côté, J., & Fraser-Thomas, J. (2011). Youth involvement and positive development in sport. In P. R. E. Crocker (ed.). *Sport psychology: A Canadian perspective*, (2nd ed., pp. 226-255). Toronto, ON: Pearson Prentice Hall
- Côté, J., MacDonald, D. J., Baker, J., & Abernethy, B. (2006). When ‘where’ is more important than ‘when’: Birthplace and birthdate effects on the achievement of sporting expertise. *Journal of Sports Sciences*, 24(10), 1065-1073.
- Côté, J., Turnnidge, J., & Evans, M. B. (2014). The dynamic process of development through sport. *Kinesiologia Slovenica*, 20(3), 14-26.
- Côté, J., Turnnidge, J., & Vierimaa, M. (2016). A personal assets approach to youth sport. In A. Smith & K. Green (Eds.), *Handbook of youth sport* (pp. 243-254). London, UK: Routledge.

- Delorme, N. (2014). Do weight categories prevent athletes from relative age effect?
Journal of Sports Sciences, 32, 16-21.
- Delorme, N., Boiché, J., & Raspaud, M. (2009). The relative age effect in elite sport: The French case. *Research Quarterly for Exercise and Sport*, 80(2), 336-344.
- Delorme, N., Boiché, J., & Raspaud, M. (2010a). Relative age effect in female sport: A diachronic examination of soccer players. *Scandinavian Journal of Medicine & Science in Sports*, 20, 509-515.
- Delorme, N., Boiché, J., & Raspaud, M. (2010b). Relative age and dropout in French male soccer. *Journal of Sports Sciences*, 28(7), 717-722.
- Delorme, N., Chalabaev, A., & Raspaud, M. (2011). Relative age is associated with sport dropout: Evidence from youth categories of French basketball. *Scandinavian Journal of Medicine & Science in Sports*, 21, 120-128.
- Dhuey, E., Figlio, D., Karbownik, K., & Roth, J. (2017, August). School starting age and cognitive development [working paper 23660]. Cambridge, MA: National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w23660.pdf>
- Dhuey, E., & Lipscomb, S. (2008). What makes a leader? Relative age and high school leadership. *Economics of Education Review*, 27, 173-183.
- Dixon, J. C., Horton, S., & Weir, P. (2011). Relative age effects: Implications for leadership development. *International Journal of Sport and Society*, 2(2), 1-15.

- Dworkin, J. B., Larson, R., & Hansen, D. (2003). Adolescents' accounts of growth experiences in youth activities. *Journal of Youth and Adolescence*, 32(1), 17-26.
- Elashoff, J. D., & Snow, R. E. (1971). *Pygmalion reconsidered*. Worthington, OH: Charles A. Jones.
- Elder, T. (2010). The importance of relative standards in ADHD diagnoses: Evidence based on exact birth dates. *Journal of Health Economics*, 29(5), 641-656.
- Fraser-Thomas, J. L., Côté, J., & Deakin, J. (2005). Youth sport programs: An avenue to foster positive youth development. *Physical Education and Sport Pedagogy*, 10(1), 19-40.
- Freyman, R. (1965). Further evidence on the effect of date of birth on subsequent school performance. *Educational Research*, 8, 58-64.
- Furley, P., & Memmert, D. (2016). Coaches' implicit associations between size and giftedness: Implications for the relative age effect. *Journal of Sports Sciences*, 34, 459-466.
- Grondin, S., Deshaies, P., & Nault, L. P. (1984). Trimestres de naissance et participation au hockey et au volleyball. [Birth quarters and participation in hockey and volleyball]. *La Revue Québécoise de l'Activité Physique*, 2, 97-103.
- Hancock, D. (2020). Antecedents and explanations of relative age effects. In J. C. Dixon, S. Horton, L. Chittle., & J. Baker (Eds.), *Relative age effects in sport: International perspectives*. New York, NY: Routledge.

- Hancock, D. (2017). Female relative age effects and the second-quartile phenomenon in young female ice hockey players. *Psychology of Sport and Exercise*, 32, 12-16.
- Hancock, D. J. (2016). Relative age effects and positive youth development. *Journal of Sport & Exercise Psychology*, 38, S199.
- Hancock, D. J., Adler, A. L., & Côté, J. (2013) A proposed theoretical model to explain relative age effects in sport. *European Journal of Sport Science*, 13(6), 630-637.
- Hancock, D., J., & Côté, J. (2014). Birth advantages, social agents, and talent development in youth sport. In A. R. Gomes, R. Resende, & A. Albuquerque (Eds.), *Positive human functioning from a multidimensional perspective, Volume 3: Promoting high performance* (pp. 15-32). New York, NY: Nova Science.
- Hancock, D. J., Seal, K., Young, B. W., Weir, P. L., & Ste-Marie, D. M. (2013). Examining mechanisms that contribute to relative age effects in pre-pubescent female ice hockey players. *Talent Development & Excellence*, 5, 59-66.
- Hancock, D. J., Ste-Marie, D. M., & Young, B. W. (2013). Coach selections and the relative age effect in male youth ice hockey. *Research Quarterly for Exercise and Sport*, 84, 126-130.
- Helsen, W. F., Starkes, J. L., & Van Winckel, J. (1998). The influence of relative age on success and dropout in male soccer players. *American Journal of Human Biology*, 10, 791-798.

- Hirose N. (2009). Relationships among birth-month distribution, skeletal age and anthropometric characteristics in adolescent elite soccer players. *Journal of Sport Sciences*, 27, 1159–1166.
- Hockey Canada. (n.d.). *Male to female branch registration comparison*. Retrieved from <https://cdn.hockeycanada.ca/hockey-canada/Hockey-Programs/Female/Downloads/Male-to-Female-Branch-Registration-Comparison.pdf>
- Hockey Canada. (2019). *Hockey Canada annual report July 2018-June 2019*. Retrieved from <https://cdn.agilitycms.com/hockey-canada/Corporate/About/Downloads/2018-19-hockey-canada-annual-report-e.pdf>
- Holt, N. L., Neely, K. C., Slater, L. G., Camiré, M., Côté, J., Fraser-Thomas, J., . . . Tamminen, K. A. (2017). A grounded theory of positive youth development through sport based on results from a qualitative meta-study. *International Review of Sport and Exercise Psychology*, 10(1), 1-49.
- Holt, N. L., Sehn, Z. L., Spence, J. C., Newton, A. S., & Ball, G. D. C., (2012). Physical education and sport programs at an inner city school: Exploring possibilities for positive youth development. *Physical Education and Sport Pedagogy*, 17(1), 97-113.
- Hurley, W., Lior, D., & Tracze, S. (2001). A proposal to reduce the age discrimination in Canadian minor hockey. *Canadian Public Policy*, 27(1), 65-75.

- Gould, D., & Carson, S. (2008). Life skills development through sport: Current status and future directions. *International Review of Sport and Exercise Psychology, 1*, 58-78.
- Larson, R. (2000). Toward a psychology of positive youth development. *American Psychologist, 55*(1), 170-183.
- Lemez, S., Baker, J., Horton, S., Wattie, N., & Weir, P. (2014). Examining the relationship between relative age, competition level, and dropout rates in male youth ice-hockey players. *Scandinavian Journal of Medicine & Science in Sports, 24*(6), 935-942.
- Larson, R., Hansen, D., & Moneta, G. (2006). Differing profiles of developing experiences across types of organized youth activities. *Developmental Psychology, 42*(5), 849-863.
- Lerner, R. M., Fisher, C. B., & Weinberg, R. A. (2000). Toward a science for and of the people: Promoting civil society through the application to developmental science. *Child Development, 71*(1), 11-20.
- Lovell, R., Towlson, C., Parkin, G., Portas, M., Vaeyens, R., & Copley S. (2015). Soccer player characteristics in English lower-league development programmes: The relationships between relative age, maturation, anthropometry and physical fitness. *PLoS ONE, 10*(9), e0137238.
- MacDonald, D. J., Côté, J., Eys, M., & Deakin, J. (2012). Psychometric properties of the youth experience survey with young athletes. *Psychology of Sport and Exercise, 13*, 332-340.

- Merton, R. K. (1948). The self-fulfilling prophecy. *The Antioch Review*, 8, 193-210.
- Merton, R. K. (1957). *Social theory and social structure*. Glencoe, IL: The Free Press.
- Merton, R. K. (1968). The Matthew effect in science. *Science*, 159, 56-63.
- Montelpare, W. J., Scott, D., & Pelino, M. (2000). Tracking the relative age effect across minor, amateur and professional ice-hockey leagues. In A. B. Ashare (Ed.), *Safety in ice hockey* (Vol. 3, pp. 250-260). Philadelphia, PA: American Society for Testing and Materials.
- Musch, J., & Grondin, S. (2001). Unequal competition as an impediment to personal development: A review of the relative age effect in sport. *Developmental Review*, 21, 147-167.
- Newell, K. M. (1986). Constraints on the development of coordination. In M. G. Wade, H. T. A. Whiting (Eds.), *Motor development in children: Aspects of coordination and control* (pp. 341-361). Dordrecht, Netherlands: Martinus Nijhoff.
- Nolan, J. E., & Howell, G. (2010). Hockey success and birth date: The relative age effect revisited. *International Review for the Sociology of Sport*, 45(4), 507-512.
- Petitpas, A. J., Cornelius, A. E., Van Raalte, J. L., & Jones, T. (2005). A framework for planning youth sport programs that foster psychosocial development. *The Sport Psychologist*, 19(1), 63-80.
- Romann, M., & Cobley, S. (2015). Relative age effects in athletic sprinting and corrective adjustments as a solution for their removal. *PLoS One*, 10(4),

e0122988.

- Roth, J. Brooks-Gunn, J., Murray, L., & W. Foster. (1998). Promoting healthy adolescents: Synthesis of youth development program evaluations. *Journal of Research on Adolescence*, 8, 423-459.
- Rosenthal, R., & Jacobson, L. (1968). *Pygmalion in the classroom*. New York, NY: Holt.
- Schorer, J., Cogley, S., Büsch, D., & Baker, J. (2009). Influences of competition level, gender, player nationality, career stage and playing position on relative age effects. *Scandinavian Journal of Medicine & Science in Sports*, 29(5), 720-730.
- Schorer, J., Wattie, N., Baker, J. (2013). A new dimension to relative age effects: Constant year effects in German youth handball. *PLoS ONE*, 8(5), e60336.
- Sherar, L. B., Baxter-Jones, A. D. G. Faulkner, R. A., & Russell, K. W. (2007). Do physical maturity and birth date predict talent in male youth ice hockey players? *Journal of Sports Sciences*, 25(8), 879-886.
- Smith, K. L., & Weir, P. L. (2013). An examination of the relative age effect in developmental girls' hockey in Ontario. *High Ability Studies*, 24(2), 171-184.
- Smith, K. L., Weir, P. L., Till, K., Romann, M., & Cogley, S., (2018). Relative age effects within female sport contexts: A systematic review and meta-analysis. *Sports Medicine*, 48(6), 1451-1478.
- Stenling, A., & Holmström, S. (2014). Evidence of relative age effects in Swedish women's ice hockey. *Talent Development & Excellence*, 6(1), 31-40.

- Sullivan, P. J., LaForge-MacKenzie, K., & Marini, M. (2015). Confirmatory factor analysis of the youth experiences survey for sport (YES-S). *Open Journal of Statistics, 5*, 421-429.
- Thompson, A. H., Barnsley, R. H., & Dyck, R. J. (1999). A new factor in youth suicide: The relative age effect. *Canadian Journal of Psychiatry, 44*(1), 82-85.
- Turnnidge, J., Hancock, D. J., & Côté, J. (2014). The influence of birth date and place of development on youth sport participation. *Scandinavian Journal of Medicine & Science in Sports, 24*(2), 461-468.
- Vincent, J., & Glamser, F. D. (2006). Gender differences in the relative age effect among US Olympic development program youth soccer players. *Journal of Sports Sciences, 24*(4), 405-413.
- Wattie, N., Baker, J., Cobley, S., & Montelpare, W. J. (2007). A historical examination of relative age effects in Canadian hockey players. *International Journal of Sport Psychology, 38*(2), 178-186.
- Wattie, N., MacDonald, D.J., & Cobley, S. (2015). Birthdate and birthplace effects on expertise attainment. In J. Baker & D. Farrow (Eds.), *The Routledge handbook of sport expertise* (pp. 373-382). London, UK: Routledge.
- Wattie, N., Schorer, J., & Baker, J. (2015). The relative age effect in sport: A developmental systems model. *Sports Medicine, 45*(1), 83-94.
- Wattie, N., Sornberger, B., & Fraser-Thomas, J. (2018). The influence of relative age on youths' developmental experiences in sport. *Journal of Exercise, Movement, and*

Sports (A SCAPPS Publication), 50(1). Retrieved from
<https://www.scapps.org/jems/index.php/1/article/view/1906>

Weir, P. L., Smith, K. L., Paterson, C., & Horton, S. (2010). Canadian women's ice hockey - evidence of a relative age effect. *Talent Development & Excellence*, 2(2), 209-217.

CHAPTER 2
EXAMINING THE ROLE OF RELATIVE AGE ON LEADERSHIP BEHAVIORS
AMONG FEMALE ICE HOCKEY PLAYERS: AN EXPLORATORY
INVESTIGATION⁴

Introduction

Sport can provide opportunities for youth to develop physical health, psychosocial development (e.g., leadership, co-operation) and motor skills (Côté & Fraser-Thomas, 2011). Accomplishing these objectives can enhance the benefits of sport participation and equip youth with foundational skills that can be transferred to other avenues in their lives. Within sport organizations, it is common practice to employ cut-off dates to group participants into age cohorts. While unintentional, the use of cut-off dates can undermine the objectives of youth sport by creating relative age differences between participants. These differences in age between individuals grouped into the same cohort can lead to relative age effects (RAEs), which describe the relative (dis)advantages experienced by those born early in the year relative to a pre-determined cut-off date (Barnsley, Thompson, & Barnsley, 1985).

Within the sport development literature, RAEs have been associated with relatively younger athletes dropping out of sport (e.g., Barnsley & Thompson, 1988; Lemez, Baker, Horton, Wattie, & Weir, 2014), hence, diminishing opportunities for

⁴ This chapter represents an edited version of the following manuscript: Chittle, L., Horton, S., & Dixon, J. C. (in press). Examining the role of relative age on leadership behaviors among female ice hockey players: An exploratory investigation. *Journal of Amateur Sport*.

athletes to experience the benefits of sport. These negative consequences may contrast the experiences of relatively older athletes who are more often selected to participate on elite teams early on in their development, which are associated with better coaching, more practice and play time, and greater competition (Barnsley, Thompson, & Legault, 1992; Helsen, Starks, & Van Winckel, 1998). This additional training can lead to accumulated advantages for relatively older athletes that persist over time. One method to mitigate the advantages afforded to relatively older athletes would be to delay the age at which children begin participating in competitive sport (i.e., delay streaming; Baker, Schorer, & Cobley, 2010).

Within education, relatively younger individuals have been disadvantaged, whereby they earn lower grades, have poorer school attendance rates (Cobley, McKenna, Baker, & Wattie, 2009a), experience fewer leadership opportunities (Dhuey & Lipscomb, 2008), and are less likely to attend post-secondary institutions (Bedard & Dhuey, 2006; Dhuey, Figlio, Karbownik, & Roth 2017). Consequently, across RAE studies within sport and educational contexts “...children with a relative age disadvantage are more likely to encounter problems in the particular activity for which they have been ‘age grouped’” (Thompson, Barnsley, & Dyck, 1999, p. 83).

Despite there being well-established sport participation disadvantages associated with being relatively younger (e.g., Cobley, Baker, Wattie, & McKenna, 2009b; Smith, Weir, Till, Romann, & Cobley, 2018), there has been limited research that moves beyond exploring participation rates to examine how relative age may influence important psychological factors within sport, such as leadership. Within sport, athletes may have formal (e.g., captain) and informal leadership positions aimed at influencing teammates

to achieve a shared objective (Loughead, Hardy, & Eys, 2006). Formal and informal leaders may assume various leadership roles within teams, including those related to task (e.g., provides tactical advice), social (e.g., promotes good relations within the team), external (e.g., representative of the team to club management), and motivational functions (e.g., encourages teammates) (Fransen, Vanbeselaere, De Cuyper, Vande Broek, & Boen, 2014). Formal captains may also have specific responsibilities related to communicating with teammates, liaising between coaches and teammates, performing administrative duties (e.g., off-season planning), and working to improve the team climate, norms, and functioning (Dupuis, Bloom, & Loughead, 2006). As such, the presence of leadership is an important aspect to any team.

Hockey has served as a popular context to explore RAEs (Cobley et al., 2009b); however, the vast majority of these studies have targeted male athletes, with far fewer investigations conducted in female hockey (Smith et al., 2018). Over the last 20 years, there has been considerable growth in the number of female hockey registrants (Hockey Canada, 2017a; Hockey Canada, n.d.), suggesting that this sport may be attracting more competition and thus, creating an environment that cultivates RAEs (Musch & Grondin, 2001). In an attempt to move beyond simply exploring the presence of RAEs, this study addresses the paucity of research related to relative age and leadership. As a result, we conducted a multifaceted study to: a) test for a RAE among competitive female ice hockey players; b) explore how relative age influences leadership behaviors among competitive female ice hockey players, and; c) examine differences in leadership behaviors across leadership status (i.e., captains vs. non-captains).

Literature Review

Athlete Leadership

Athlete leadership refers to an athlete occupying a formal or informal leadership position on a team who influences teammates to achieve a common goal (Loughead et al., 2006). This definition recognizes both formal and informal leadership roles, whereby a formal leader is assigned a position (e.g., captain), while an informal leader emerges based upon his/her interaction with teammates (Loughead et al., 2006). While a large body of leadership research has focused on coaches, there is mounting support indicating the important role that athlete leaders possess on a team (Bucci, Bloom, Loughead, & Caron, 2012; Eys, Loughead, & Hardy, 2007). Loughead and Hardy (2005) found that athlete leaders demonstrated higher frequencies of social support, positive feedback, and democratic behavior than coaches. Furthermore, athlete leadership can influence important individual and team outcomes, including satisfaction (e.g., Eys et al., 2007; Paradis & Loughead, 2012), cohesion (e.g., Callow, Smith, Hardy, Arthur, & Hardy, 2009; Vincer & Loughead, 2010), and performance (e.g., Callow et al., 2009).

While athletes may assume or be assigned different roles on their teams, there is growing support for the existence of shared leadership on sports teams (e.g., Bucci et al., 2012; Fransen et al., 2015a; Fransen et al., 2015b). Specifically, Crozier, Loughead, and Munroe-Chandler (2013) suggested that 85% of athletes on a team should occupy a leadership role (19% occupying a formal role and 66% an informal role), as this benefits a number of team (e.g., cohesion, team processes) and individual (e.g., satisfaction) outcomes. Furthermore, Crozier, Loughead, and Munroe-Chandler (2017) indicated that

the frequency with which athletes engage in leadership behaviors could differ by leader status (i.e., formal leader, informal leader, and follower). If relative age influences the frequency of leadership behaviors exhibited among athletes, then this may have implications for team success and individuals' experiences with their teams. In the long-term, ensuring athletes have opportunities to develop and demonstrate leadership skills can have positive implications for their future careers.

Despite the importance of athlete leadership, it is a relatively new field. Consequently, the theories used to examine this concept have been primarily derived from organizational psychology or sport coaching (Loughead, 2017). For example, the multidimensional model of leadership (MML; Chelladurai, 1978, 1993)⁵ is a popular framework applied to coaching leadership, but has also been utilized to study athlete leadership (Loughead, 2017). The MML is a linear model comprised of antecedents, leader behaviors, and consequences of leadership. The antecedents consist of situational (e.g., type of sport, level of sport), leader (e.g., age, gender, personality), and member (e.g., ability, experience, team member personal characteristics) characteristics and influence the three states of leader behaviors: required, actual, and preferred. Consequences include member satisfaction and group performance, which are the result of the degree of congruence among the three states of leader behavior. Relative age may be an important antecedent that influences individuals' leader behaviors.

According to the MML (Chelladurai, 1978, 1993), an athlete's sex can influence their preferences for leader behavior as well as the required behavior of the leader.

⁵ For a detailed description of the MML please see Chelladurai (2007).

Furthermore, within the sport psychology literature, research has suggested that preferences for specific leadership behaviors may differ by sex. For example, Holmes, McNeil, and Adorna (2010) examined collegiate student-athletes' perceptions of formal and informal leaders and found being vocal, sensitive, and having strong interpersonal skills were more important for females than males, while trustworthiness and experience were more important for males. Moreover, male athletes have a greater preference for autocratic and social support behaviors, while females prefer situational consideration and training and instruction behaviors (Beam, Serwatka, & Wilson, 2004). Therefore, it seems logical that the leadership behaviors athletes perceive themselves as demonstrating may be different for females than males. Furthermore, it remains possible that relative age will affect leadership behaviors in female sport differently than male sport, given that an athlete's sex can influence the perceptions/preferences for leadership (e.g., Beam et al., 2004; Holmes et al., 2010).

RAEs and Leadership

While many studies have explored the presence of RAEs (e.g., Cogley et al., 2009b; Smith et al., 2018), few have examined the implications of relative age on broader psychosocial outcomes. Bedard and Dhuey (2006) acknowledge that, "...if early relative maturity effects propagate themselves through the human capital accumulation process into later life, long after small differences in age are important in and of themselves, they may have important implications for adult outcomes and productivity" (p. 1437). Dhuey and Lipscomb (2008) provided evidence that an individual's relative age can influence leadership opportunities within an educational context. Specifically, relatively older students more commonly (i.e., 4-11%) hold leadership roles and accumulate

approximately 5% more leadership experience upon graduation than their younger classmates. This is important given that leadership has become an essential ‘soft skill’ in the workforce (Dhuey & Lipscomb, 2008). Evidence indicates that students who acquire leadership experience earn 4-33% higher adult wages (known as a ‘leadership-wage effect’) and more frequently hold managerial positions (Kuhn & Weinberger, 2005).

To the best of our knowledge, there have only been two prior studies that have examined the influence of relative age on the leadership behaviors of athletes, with these projects targeting male ice hockey players (Chittle, Horton, & Dixon, 2017; Chittle, Horton, Weir, & Dixon, 2017). Chittle, Horton, Weir, et al. (2017) examined house league male ice hockey players and found no significant differences in leadership behaviors across birth quartiles. Similarly, for competitive male ice hockey players, relative age did not appear to influence the frequency with which they exhibited leadership behaviors (Chittle, Horton, & Dixon, 2017). Both of these studies were exploratory in nature and included only male samples. Since sex is considered an important individual constraint that can influence the RAE profile (Wattie, Schorer, & Baker, 2015), there is merit in extending the work of Chittle, Horton, Weir, et al. (2017) by examining how relative age influences the leadership behaviors of competitive female ice hockey players.

RAEs in Female Ice Hockey

Relative age effects are highly prevalent in male ice hockey both at the elite and youth levels (Cobley et al., 2009b). Within the RAE literature, a large proportion of studies have targeted male ice hockey (Cobley et al., 2009b), with relatively fewer studies

carried out in female ice hockey. Wattie, Baker, Cobley, and Montelpare (2007) provided early evidence of a lack of RAE among Canadian Women's National Championship players. Subsequently, Weir, Smith, Paterson, and Horton (2010) broadened Wattie et al.'s (2007) sample to include both national and international athletes and found an atypical RAE pattern, characterized by an overrepresentation of players born in quartile two⁶. Across their samples, 60% of these elite female players were born in the first half of the year, while 40% were born in the latter half. Likewise, Chittle, Horton, and Dixon (2015) found a similar RAE trend among interuniversity female ice hockey players, where quartile two was the most overrepresented and 60% of players were born in the first six months of the year. Significant traditional RAEs (i.e., linear decline from quartiles one to four) have also been noted in elite and junior elite Swedish women's hockey (Stenling & Holmström, 2014). While there are fewer studies to draw upon, it appears that RAEs are present at the most elite levels of female ice hockey, similar to what has been found in male ice hockey (notwithstanding the differences in RAE patterns).

At the developmental level, RAEs have been consistently demonstrated across female age cohorts (e.g., Hancock, 2017; Hancock, Seal, Young, Weir, & Ste-Marie, 2013; Smith & Weir, 2013; Stenling & Holmström, 2014). Smith and Weir (2013) provided a comprehensive analysis of Ontario Women's Hockey Association players from novice (≤ 8 years) to senior/masters levels (open age) and found significant

⁶ A quartile refers to when the calendar year is divided into four approximately equal divisions based upon a cut-off date. When using 1 January as the cut-off point (as is the case with ice hockey in Canada), Quartile 1 includes January, February and March, Quartile 2 consist of April, May and June, Quartile 3 encompasses July, August and September, and Quartile 4 represents October, November and December.

differences between the birth distributions of players and a theoretically equal distribution across birth quartiles for all divisions except intermediate (21 and under) and senior/masters. Therefore, it appears that from approximately 8 to 17 years of age, RAEs are persistent. Across these age divisions, the RAE pattern was often atypical, with an overrepresentation of athletes born in quartile two. Similarly, Hancock et al., (2013) and Hancock (2017) found RAEs among Ontario Hockey Federation female ice hockey players, where quartile two was frequently the most overrepresented.

This non-linear RAE pattern has been prevalent in other female sports (e.g., Baker, Schorer, Cobley, Bräutigam, & Büsch, 2009); however, there have been few attempts to decipher its cause. Hancock (2017) explored this second-quartile phenomenon by examining if the relatively oldest female athletes were competing on male ice hockey teams instead. There was minimal support for this hypothesis, as this study revealed an overrepresentation of female players born in quartile two in many of the male ice hockey divisions as well. A quartile two overrepresentation was also seen when age divisions were collapsed and analyzed together. Other proposed explanations for the overrepresentation of females born in quartile two include quartile one athletes more commonly participating in traditionally stereotyped female sports (e.g. swimming, ringette; Hancock et al., 2013) and the lack of body checking in female ice hockey, which may lead to coaches selecting athletes based upon skill rather than physical size (Hancock, 2017). Alternatively, Wattie et al. (2014) provided an additional explanation within the context of artistic and individual sports where the relatively oldest may reach puberty earlier and experience negative responses from doing so (e.g., depression, weight concerns), and thereby reduce their sport enjoyment and involvement. Given that sex can

influence both leadership behaviors and RAE patterns, the goal of this study is to: test for a RAE, explore how relative age may influence the self-rated leadership behaviors of competitive female ice hockey players, and examine differences in leadership behaviors across leader status (i.e., captains versus non-captains).

Method

Sample and Recruitment

Competitive (i.e., where coach selections are made) female ice hockey players ($m_{\text{age}} \sim 15.99$ years; range 15-18 years) were targeted for inclusion in this study. All participants were Canadian born and competed in Canada, as different countries may employ varying cut-off dates due to different sport development systems, which may confound the influence of relative age. Recruitment took place at competitive female ice hockey tournaments held across the province of Ontario, and through attending ice hockey games and practices for teams throughout the 2017-2018 season. While at these events, members of the research team set-up iPads and verbally invited players to complete the online survey on the iPads or another mobile device. Participants completed an online survey (hosted by Qualtrics) that evoked general demographic information, details on previous ice hockey experiences, and responses to items associated with the Leadership Scale for Sport (LSS; Chelladurai & Saleh, 1980). This project received clearance by the authors' institutional Research Ethics Board.

Leadership Scale for Sports (LSS)

The LSS was developed by Chelladurai and Saleh (1980) as a tool to operationalize the MML. The LSS is a 40-item questionnaire that measures the frequency

of five leadership behaviors: *training and instruction*, *democratic behavior*, *autocratic behavior*, *social support* and *positive feedback* (Chelladurai & Saleh, 1980). The training and instruction dimension (13 items) examines a leader's behavior in terms of improving the performance of the athletes on his/her team (e.g., 'see to it that every team member is working to her/his capacity'). The democratic behavior dimension (nine items) reflects the leader's tendency to involve teammates in decision-making (e.g., 'let fellow team members share in decision making'). The autocratic behavior dimension (five items) concerns how the leader stresses his or her authority and independence in decision making (e.g., 'work relatively independent of other team members'). The social support dimension includes eight items that measure the extent to which the leader demonstrates concern for the welfare of team members (e.g., 'help team members with their personal problems'). Finally, the positive feedback dimension (five items) reflects the leader's tendency to recognize and reinforce the athletes' performances and contributions (e.g., 'compliment a team member for her/his performance in front of others'). All items on the LSS were scored on a five-point Likert scale: (1) never, (2) seldom—25% of the time, (3) occasionally—50% of the time, (4) often—75% of the time, and (5) always. Higher scores represent stronger perceptions of the leadership behavior. Since the LSS measures five distinct types of leadership behavior, an overall (or total score) is not calculated for the LSS. Instead, we determined mean scores for each of the five dimensions for each participant. Cronbach's (1951) alpha (α) scores were calculated to measure the internal consistency of the dimensional subscales, with scores of .70 indicating that responses were consistent (or reliable) across the items within each scale (Kline, 2005).

While the LSS was originally created to assess coaching leadership behavior (Loughead, 2017), it has also been successfully employed to measure athlete leadership (e.g., Crozier et al., 2017; Paradis & Loughead, 2012; Vincer & Loughead, 2010). Acceptable internal consistency values (e.g., Loughead & Hardy, 2005; Vincer & Loughead, 2010), convergent validity (e.g., Paradis & Loughead, 2012; Vincer & Loughead, 2010), and factorial validity (e.g., Vincer & Loughead, 2010) have been demonstrated when using the LSS to assess athlete leadership. Participants self-rated their own leadership behaviors using the LSS, which has been successfully employed among intercollegiate athletes (Crozier et al., 2017) and male ice hockey players (Chittle, Horton, & Dixon, 2017; Chittle, Horton, Weir, et al., 2017). As such, a modified stem that reads “On my team, I...” preceded each item and some items were slightly modified to ensure an appropriate context for athletes’ self-evaluations and the comprehension level of the sample.

Data Analysis

Prior to data analysis, the sample was delimited to include those participants who provided information on their date of birth and who answered a minimum of 80% of the LSS. Four participants were removed due to not providing their date of birth and all of the remaining participants met the 80% threshold for responding to the LSS items. Upon inspection, there were only three missing data points which were dealt with using case mean substitution (El-Masri & Fox-Wasylyshyn, 2005). This approach is considered appropriate when 20% or fewer items are missing (Downey & King, 1998). The final sample consisted of 246 female ice hockey players.

Determining a RAE

Hockey Canada (2017b) relies on a December 31st cut-of date to create age cohorts. Therefore, quartile one (Q1) consisted of those born in January, February, and March, quartile two (Q2) contained those born in April, May, and June, quartile three (Q3) comprised those born in July, August, and September, and quartile four (Q4) represented those born in October, November, and December. To determine if a RAE was present in this sample, a chi-square goodness of fit test (X^2) was conducted at a significance level of $p < .05$. By employing this statistical test, we were able to draw comparisons between the observed distribution of athletes across birth quartiles and what was expected based upon average Canadian population birth rates from the Human Fertility Database (2000-2002). These birth years accounted for 95.9% of the participants in this study. A second chi-square goodness of fit test was conducted using the expected frequency of birthdates from Hancock's (2017) analyses of female Ontario Hockey Federation players competing in the Midget age category (i.e., aged 15-17 years). Deriving the expected distribution from this 'parent' population reduced the chances of making a Type I error (Delorme & Champely, 2015).

Relative Age and Leadership

A MANOVA was performed to determine if relative age influenced the frequency of leadership behaviors, as measured by the LSS. For the purpose of this analysis, birth quartile served as the independent variable (i.e., four birth quartiles) and the five LSS dimensions were the dependent variables. Following a significant MANOVA, multivariate omega squared (ω^2_{mult}) was calculated. Multivariate statistical assumptions

were tested prior to conducting the MANOVA. Specifically, three outliers were identified within the sample (i.e., z -scores exceeding $|3.29|$; Tabachnick & Fidell, 2013). In order to maintain the sample size, Winsorizing was employed to replace outliers (Field, 2013). In applying this approach, the outlier case was adjusted to the next lowest (non-outlier) value within the corresponding dependent variable. Following Winsorizing, z -scores were examined a second time to ensure the previously identified cases were no longer outliers. One case was identified as a multivariate outlier, exceeding the critical value of $X^2(5)_{p=0.001} = 20.51$; however, the Cook's distance point was less than 1.0, indicating it was not an influential data point and was therefore retained (Tabachnick & Fidell, 2013; Stevens, 2009). Multicollinearity among dependent variables was tested to ensure variables were related, but not redundant. No bivariate correlations (See Table 1) were above $|0.90|$ (Tabachnick & Fidell, 2013) and no variance inflation factor (VIF) values were greater than 10 (Fields, 2013; Myers, 1990), indicating no issues with multicollinearity. Univariate normality was assessed by calculating skewness (cut-off point $> |2|$) and kurtosis (cut-off point $> |7|$) values (Curran, West, & Finch, 1996), while multivariate normality was explored through the examination of the standardized residual histogram plot. In each case, there was no violation to these assumptions. Homogeneity of covariance was tested and examined through the Box's M Test of Equality of Covariance (Fields, 2013), with significance evaluated at 0.001 due to the sensitivity of this test (Tabachnick & Fidell, 2013). This assumption was also satisfied. Absolute age, the number of years athletes participated in organized hockey, and the number of times they held a leadership role in ice hockey, another sport, and school were also considered as

potential covariates but were not sufficiently correlated with the dependent variables to be included within the analysis.

Four of the five LSS subscales had acceptable internal consistencies: training and instruction $\alpha = .86$, democratic behavior $\alpha = .74$, social support $\alpha = .79$, and positive feedback $\alpha = .77$. Consistent with prior research (e.g., Chittle, Horton, Weir, et al., 2017; Crozier et al., 2017), autocratic behavior ($\alpha = .55$) failed to meet the minimum threshold for internal consistency. Chelladurai and Riemer (1998) indicated that this may be the result of the items within the autocratic behavior subscale not reflecting autocratic behavior in the traditional sense (i.e., opposite to democratic behavior), but nevertheless recommend that the subscale be retained.

Comparing Leadership Status

A MANOVA was conducted to examine if there were significant differences in the frequency of leadership behaviors displayed by athletes who identified as formal leaders (i.e., captain/alternative captain) compared with those who did not. Four participants were removed from the sample ($n = 242$) due to them not indicating whether they were a current captain or alternate captain. All multivariate assumptions were tested. Three cases were initially identified as univariate outliers, exceeding $|3.29|$. However, upon being Winsorized, they were no longer outliers. One case was identified as a multivariate outlier, exceeding the critical value of $X^2(5)_{p=0.001} = 20.51$, yet, the Cook's distance point was less than 1.0, indicating it was not an influential data point and was retained. Assumptions regarding univariate and multivariate normality, multicollinearity and Box's M Test of Equality of Covariance were all met. Following a significant

MANOVA, a discriminate analysis was performed as this test recognizes that relationships exist between dependent variables and can be used to determine the linear combination(s) of dependent variables that discriminates (separates) the groups (Field, 2013). This test provided an indication of which linear combination of LSS dimensions discriminated athlete leader status (i.e., formal versus informal leaders).

Results

Relative Age Effect

Within this sample ($n = 246$) there was a linear decline in the number of athletes born in each quartile: 72 (29.3%) of athletes born in quartile one, 67 (27.2%) in quartile two, 59 (24.0%) in quartile three, and 48 (19.5%) in quartile four. Despite the RAE trend, the result of the chi-square goodness of fit test revealed no significant differences between the observed distribution of athletes' birthdates with what is expected based upon Canadian population birth rates ($X^2 = 4.386$, $df = 3$, $p = 0.223$; see Figure 1). Similarly, the second chi-square goodness of fit test, using OHF birthrates as the expected values, failed to reach significance ($X^2 = 1.984$, $df = 3$, $p = 0.576$; see Figure 1).

Leadership and Relative Age

While we have established a RAE trend in this sample (albeit not significant), this information was used to test if relative age has an impact on the frequency of leadership behaviors female ice hockey players display. The MANOVA analysis revealed no significant multivariate differences between quartile of birth on the five LSS dimensions

(Wilks' Lambda = 0.938, $F(15, 654.654) = 1.026, p = 0.426$)⁷. Thus, quartile of birth does not significantly differentiate female ice hockey players' self-reported frequency of leadership behaviors. Please see Table 2 for detailed breakdown of the LSS scores by quartile of birth.

Of the athletes who identified themselves as captains or alternate captains ($n = 57$) of their current ice hockey teams, there was a progressive linear decline from quartile one through four, suggesting a RAE trend. Specifically, 36.8% of captain/alternate captains were born in quartile one, 26.3% in quartile two, 24.6% in quartile three, and 12.3% in quartile four. Based on these results, it is possible that relative age could influence who is selected as a formal leader; however, this finding should be interpreted with caution given the proportionally small numbers of formal leaders identified within this study.

Leadership and Leader Status

The result of the MANOVA ($n = 242$) indicated significant multivariate differences between those who self-identified as formal leaders (i.e., captain or alternate captain) and informal leaders (Wilks' Lambda = 0.943, $F(5, 236) = 2.862, p = .016, \omega^2_{\text{mult}} = 0.053$). This suggests that there are differences in the frequency in which athletes engage in leadership behaviors based on their leadership status. The discriminate analysis revealed that the discriminate function, leadership, accounted for 5.71% of the variance associated with leader status, and significantly differentiated between formal and informal leaders (Wilks' Lambda = 0.943, $X^2(5) = 13.982, p = 0.016$). Specifically, social

⁷ Please note, the MANOVA was also executed without the autocratic behavior subscale and the results were still not significant.

support ($r = 0.983$), democratic behavior ($r = 0.723$), positive feedback ($r = 0.708$), and training and instruction ($r = 0.596$) discriminated between formal and informal leaders. Autocratic behavior did not make a significant contribution to the discriminate function ($r = -0.112$). Descriptive statistics indicate that formal leaders (i.e., captains/alternative captains) reported a higher frequency of training and instruction, positive feedback, democratic behavior, and social support than informal leader (see Table 3).

Discussion

The results of this study demonstrate a linear decline in participation rates across birth quartiles despite the chi-square tests failing to reach significance. The lack of significant findings contrasts with prior studies that examined RAEs among Canadian youth female ice hockey players (e.g., Hancock, 2017, Smith & Weir, 2013). However, Hancock (2017) and Smith and Weir (2013) may have attained significant findings because they utilized population data (e.g., Ontario Hockey Federation registration data; Ontario Women's Hockey Association data), which are prone to achieving small p -values (Kang, Hong, Esie, Bernstein, & Aral, 2017), while the current study consists only of a sample of female ice hockey players. Upon closer comparison of these data with those of Hancock (2017) and Smith and Weir (2013), it appears that the RAE pattern within the current study and these earlier studies are somewhat different. Specifically, Hancock (2017) and Smith and Weir (2013) commonly demonstrated an overrepresentation of athletes born in quartile two, while the current sample is characterized by a negative linear decline in the proportion of athletes born from quartile one to quartile four, which is consistent with what is often seen in male sport. The linear RAE pattern seen within the current study is unexpected given that numerous female RAE studies have witnessed

a consistent overrepresentation of athletes born in quartile two in hockey as well as other sports (e.g., Baker et al., 2009; Hancock et al., 2013). The linear trend observed in the current study may be the result of the 10-fold increase in the number of female hockey registrants within Ontario from 1993 to 2017 (Hockey Canada, 2017a; Hockey Canada, n.d.), suggesting that women's hockey is becoming more culturally relevant and attracting more competition among athletes. However, this is only speculative, given that there was only a difference of five players born in quartile one compared to quartile two.

Given that prior education research suggested that relative age may impact leadership opportunities (Dhuey & Lipscomb, 2008), we anticipated that the relatively youngest may be less likely to display leadership behaviors, particularly in sports where RAEs have been common. The results indicate (albeit cautiously) that relatively older athletes may be more likely to be selected as formal leaders, supporting Dhuey and Lipscomb's (2008) finding that relatively older students more commonly hold leadership roles. Moreover, the frequency with which athletes engage in specific leadership behaviors did not differ across quartile of birth, which aligns with the research conducted on male travel and house league players (Chittle, Horton, & Dixon, 2017; Chittle, Horton, Weir, et al., 2017). Although relatively older athletes may be more inclined to hold formal leadership roles, the findings of this study suggest that athletes perceive themselves as engaging in similar frequencies of leadership, illustrating the importance of fostering informal team leaders. Failing to reject the null hypothesis may be a positive finding as it suggests that relative age may not be impacting athlete leadership engagement. This is particularly important given that shared leadership among teammates

has positive implications for team and individual outcomes (e.g., Crozier et al., 2013; Fransen et al., 2015a).

It is possible that through participation in ice hockey, all individuals are afforded an opportunity to develop leadership skills. Larson (2000) argues that sport is an effective structured activity that allows youth to development initiative, which he considers a core requirement for other positive developmental skills such as leadership. Specifically, sport contains the three elements required to foster initiative: intrinsic motivation, concerted effort, and engagement towards a goal, which both occur over an extended period of time (Larson, 2000). Organized sport is a context where experiences garnering initiative development are common. These experiences related to initiative development include goal setting, applying effort, and learning time management (Larson, Hansen, & Moneta, 2006). As a result, we speculate that ice hockey may cultivate an environment that promotes initiative, and consequently leadership, due to the immense time commitment, the extensive length of the season, and the performance goals (e.g., attending and winning provincial tournaments) of the athletes. Since hockey is a team sport, there would also be unique demands requiring a range of leadership roles for players to fulfill (e.g., task, motivational, social, and external; see Fransen et al., 2014).

Apart from hockey involvement, no differences in leadership behaviors across relative age quartiles could also be a result of participants developing leadership through activities outside of ice hockey. For example, 154 (64.17%) participants indicated that they had been a captain or alternative captain in a sport outside of hockey (89 and 65 athletes were born in the first and second half of the year, respectively), while 158 (65.29%) participants responded that they had held leadership positions in school (91 and

67 athletes were born in the first and second half of the year, respectively). Through these other opportunities and activities, athletes may be developing a leadership skillset that can be applied to various situations. These findings may also be explained by the post-adolescent sample chosen. By recruiting post-adolescent female ice hockey players, we gathered insights from individuals who have demonstrated considerable commitment to competitive ice hockey. For example, the average number of years that participants reported playing competitive ice hockey was 7.79 years ($sd = 2.92$). It is possible that, through their continued participation in ice hockey post-puberty, the athletes in this study experienced numerous opportunities to develop leadership skills regardless of their relative ages.

In light of these null results, it is encouraging that female ice hockey players perceive themselves as engaging in the same frequency of leadership behaviors, regardless of their relative age. This is particularly beneficial given that leadership skills are valued in the workforce (Kuhn & Weinberger, 2005). It is possible that competitive ice hockey is facilitating a platform for females to develop and utilize leadership skills, regardless of their relative age. This finding is encouraging given that relatively younger athletes are often disadvantaged from participating in elite sport (e.g., Copley et al. 2009b) and have higher cessation rates (e.g., Lemez et al., 2014). Not only do these null findings address a gap in the leadership and RAE literature, but they also help paint a more comprehensive picture of the RAE phenomenon and advance the area of research (Landis, James, Lance, Pierce, & Rogelberg, 2014).

The discrimination between leader status was largely due to social support, positive feedback, democratic behavior, and training and instruction, with social support

having the largest correlation with the discriminate function. Within this sample, nearly 23.6% of athletes self-reported being a formal leader (i.e., captain/alternate captain). Moreover, formal leaders scored higher on the dimensions of democratic behavior, social support, positive feedback, and training and instruction. These findings are similar to the results of Chittle, Horton, Weir, et al. (2017), who illustrated that formal leaders within male ice hockey demonstrated higher frequencies of training and instruction, democratic behavior, and social support. Crozier et al. (2017) also found formal and informal leaders to display more social support than followers. It is not surprising that formal leaders engaged in more training and instruction behaviors since captains/alternative captains are often responsible for task behaviors (e.g., leading by example, structuring and coordinating team activities) and providing feedback to teammates (Dupuis et al., 2006; Voelker, Gould, Crawford, 2011). Similarly, captains often provide support and mentorship (Voelker et al., 2011), as well as communicate with and motivate teammates (Dupuis et al., 2006), which may help to explain why they scored higher on social support and positive feedback.

Upon examination of the mean scores for each LSS sub-scale (excluding autocratic behavior), it appears that many of the female ice hockey players in this sample are frequently demonstrating leadership behaviors. Given that mean scores are above three on the five-point Likert scale for all four of these dimensions, participants perceive themselves as engaging in these behaviors more than 50% of the time, regardless of their leadership status. Therefore, it appears that leadership may be shared amongst teammates, which is a positive finding given that athlete leadership can benefit satisfaction (e.g.,

Paradis & Loughead, 2012), cohesion (e.g., Callow et al., 2009; Vincer & Loughead, 2010), and performance (e.g., Callow et al., 2009).

Limitations and Future Directions

While the LSS has been previously used as a self-reported measure (e.g., Crozier et al., 2017), there is the possibility of bias given that participants may not respond to the questions truthfully and accurately. Furthermore, participants from this study were sampled from a single sport and only from the province of Ontario, making generalizations across other geographic locations and sports difficult. Despite this sample consisting of competitive (i.e., rep) players, athletes were recruited from different divisions (e.g., AA, A, BB) that span multiple ages, which may also confound the results. Future studies may benefit from targeting athletes within a single division, and at the most elite level, where RAEs are most common, and by segregating and analyzing data by age. Furthermore, since prior research has focused on the influence of relative age on leadership in ice hockey among post-adolescent athletes, it may be beneficial to consider other sports where RAEs are common (e.g., soccer) and in different age groups. This study did not capture the experiences of female hockey players who dropped-out of the sport or who had little experience competing; therefore, future studies may want to target female players who dropped-out of hockey in order to gain insights into their experiences and what factors may have led to their cessation.

While the LSS is a popular instrument to measure leadership behaviors, it targets the frequency with which individuals engage in such behaviors rather than leadership quality (e.g., Loughead, 2017). Future studies may benefit from examining whether

relative age influences leadership quality. Moreover, since shared leadership is common with sport teams, it may be valuable to employ novel techniques (e.g., social network analysis) to explore how leadership is distributed among team members and whether relative age is a factor. Furthermore, no research has explored how relative age may impact other types of leadership, such as transformational and transactional behaviors, which could be measured by the Differentiated Transformational Leadership Inventory (Callow et al., 2009; Hardy et al., 2010). Finally, given the dearth of literature available on how relative age influences psychosocial development, there is merit in exploring its impact on other outcomes (e.g., positive youth experiences in sport).

Conclusions

This study was exploratory and, to the best of our knowledge, the first to evaluate the influence of relative age on leadership behaviors among female athletes. Through our analyses, we confirmed that leadership behaviors can differ across leadership status and that RAE trends are present in our sample of competitive female ice hockey players. Despite initial evidence illustrating that relatively older athletes are more likely to be selected as formal leaders in female ice hockey, it appears that this does not minimize athletes' opportunities to gain leadership experiences, perhaps due to coaches focusing on developing informal leaders and emphasizing shared leadership. Given that the vast majority of RAE studies have focused on sport participation, there is merit in extending our understanding of the role relative age has on psychosocial outcomes such as leadership. As a result, this study addresses a considerable gap in the literature through identifying that leadership behaviors do not vary across birth quartiles, suggesting that

sport may be an outlet for individuals to develop these skills, which can be transferred to other avenues of their lives.

REFERENCES

- Baker, J., Schorer, J., Cogley, S., Bräutigam, H., & Büsch, D. (2009). Gender, depth of competition and relative age effects in team sports. *Asian Journal of Exercise & Sports Science, 6*(1), 1-7.
- Baker, J., Schorer, J., & Cogley, S. (2010). Relative age effects: An inevitable consequence of elite sport? *Sportwissenschaft, 40*(1), 26-30.
- Barnsley, R. H., & Thompson, A. H. (1988). Birthdate and success in minor hockey: The key to the NHL. *Canadian Journal of Behavioural Science, 20*(2), 167-176.
- Barnsley, R. H., Thompson, A. H., & Barnsley, P. E. (1985). Hockey success and birthdate: The RAE. *Canadian Association for Health, Physical Education, and Recreation, 51*, 23-28.
- Barnsley, R. H., Thompson, A. H., & Legault, P. (1992). Family planning: Football style. The relative age effect in football. *International Review for the Sociology of Sport, 27*(1), 77-86.
- Beam, J., Serwatka, T., & Wilson, W. (2004). Preferred leadership of NCAA Division I and II Intercollegiate Student Athletics. *Journal of Sport Behavior, 27*, 3-17.
- Bedard, K., & Dhuey, E. (2006). The persistence of early childhood maturity: International evidence of long-run age effects. *The Quarterly Journal of Economics, 121*(4), 1437-1474.

- Bucci, J., Bloom, G. A., Loughead, T. M., & Caron, J. G. (2012). Ice hockey coaches' perceptions of athlete leadership. *Journal of Applied Sport Psychology, 24*, 243-253.
- Callow, N., Smith, M. J., Hardy, L., Arthur, C. A., & Hardy, J. (2009). Measurement of transformational leadership and its relationship with team cohesion and performance level. *Journal of Applied Sport Psychology, 21*, 395-412.
- Chelladurai, P. (1978). *A contingency model of leadership in athletics*. Unpublished doctoral dissertation, University of Waterloo, Department of Management Sciences, Ontario, Canada.
- Chelladurai, P. (1993). Leadership. In R. N. Singer, M. Murphey, & L. K. Tennant (Eds.), *Handbook of research on sport psychology* (pp. 647–671). New York: Macmillan.
- Chelladurai, P. (2007). Leadership in sports. In G. Tenenbaum, & R. C. Eklund (Eds.), *The sport psychology handbook* (pp. 113-135). Indianapolis, IN: Wiley.
- Chelladurai, P., & Riemer, H. A. (1998). Measurement of leadership in sport. In J. L. Duda (Ed.), *Advancements in sport and exercise psychology measurement* (pp. 227-253). Morgantown, WV: Fitness Information Technology.
- Chelladurai, P., & Saleh, S. D. (1980). Dimensions of leader behavior in sports: Development of a leadership scale. *Journal of Sport Psychology, 2*, 34-45.
- Chittle, L., Horton, S., & Dixon, J. C. (2015). Exploring the relative age effect in Canadian interuniversity ice hockey. *Talent Development & Excellence, 7*(1),

69-81.

Chittle, L., Horton, S., & Dixon, J. C. (2017). *Examining the relationship between the relative age effect and leadership behaviours among competitive male ice hockey players*. Oral presentation at the North American Society for the Sociology of Sport, Windsor, Ontario.

Chittle, L., Horton, S., Weir, P., & Dixon, J. C. (2017). Investigating the relationship between the relative age effect and leadership behaviors among male ice hockey players. *International Review for the Sociology of Sport*, 52(6), 751-768.

Cobley, S., Baker, J., Wattie, N., & McKenna, J. M. (2009a). How pervasive are relative age effects in secondary school education? *Journal of Educational Psychology*, 101(2), 520- 528.

Cobley, S., Baker, J., Wattie, N., & McKenna, J. M. (2009b). Annual age-grouping and athlete development: A meta-analytic review of relative age effects in sport. *Sports Medicine*, 39(3), 235-256.

Côté, J., & Fraser-Thomas, J. (2011). Youth involvement and positive development in sport. In P. R. E. Crocker (Ed.). *Sport psychology: A Canadian perspective*, (2nd ed., pp. 226-255). Toronto, ON: Pearson Prentice Hall

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometric*, 16 297-334.

Crozier, A. J., Loughhead, T. M., & Munroe-Chandler, K. J. (2017). Top-down or shared leadership? Examining differences in athlete leadership behaviours based on

- leadership status in sport. *Physical Culture: Journal of Sport Sciences & Physical Education*, 71, 86-98.
- Crozier, A. J., Loughead, T. M., & Munroe-Chandler, K. J. (2013). Examining the benefits of athlete leaders in sport. *Journal of Sport Behavior*, 36(4), 346-364.
- Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods*, 1(1), 16-29.
- Delorme, N., & Champely, S. (2015). Relative age effect and chi-squared statistics. *International Review for the Sociology of Sport*, 50(6), 740-746.
- Dhuey, E., Figlio, D., Karbownik, K., & Roth, J. (2017, August). School starting age and cognitive development [working paper 23660]. Cambridge, MA: National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w23660.pdf>
- Dhuey, E., & Lipscomb, S. (2008). What makes a leader? Relative age and high school leadership. *Economics of Education Review*, 27, 173-183.
- Downey, R. G., & King, C. V. (1998). Missing data in Likert ratings: Comparison of replacement methods. *The Journal of General Psychology*, 125(2), 175-191.
- Dupuis, M., Bloom, G. A., & Loughead, T. M. (2006). Team captains' perceptions of athlete leadership. *Journal of Sport Behavior*, 29, 60-78.
- El-Masri, M., & Fox-Wasylyshyn, S. (2005). Missing data: An introductory overview for the novice researcher. *Canadian Journal of Nursing Research*, 37(4). 156-171.

- Eys, M. A., Loughead, T. M., & Hardy, J. (2007). Athlete leadership dispersion and satisfaction in interactive sport teams. *Psychology of Sport and Exercise*, 8, 281-296.
- Field, A. (2013). *Discovering statistics using IBM SPSS Statistics*. (4th ed.). Thousand Oaks, CA: Sage.
- Fransen, K., Vanbeselaere, N., De Cuyper, B., Vande Broek, G., & Boen, F. (2014). The myth of the team captain as principal leader: Extending the athlete leadership classification within sport teams. *Journal of Sports Sciences*, 32(14), 1389-1397.
- Fransen, K., Van Puyenbroeck, S., Loughead, T. M., De Cuyper, B., Vanbeselaere, N., Vande Broek, G., & Boen, F. (2015a). The art of athlete leadership: Identifying high-quality leadership at the individual and team level through social network analysis. *Journal of Sport & Exercise Psychology*, 37, 274-290.
- Fransen, K., Van Puyenbroeck, S., Loughead, T. M., De Cuyper, B., Vanbeselaere, N., Vande Broek, G., & Boen, F. (2015b). Who takes the lead? Social network analysis as a pioneering tool to investigate shared leadership within sports teams. *Social Networks*, 43, 28-38.
- Hancock, D. (2017). Female relative age effects and the second-quartile phenomenon in young female ice hockey players. *Psychology of Sport and Exercise*, 32, 12-16.
- Hancock, D. J., Seal, K., Young, B. W., Weir, P. L., & Ste-Marie, D. M. (2013). Examining mechanisms that contribute to relative age effects in pre-pubescent female ice hockey players. *Talent Development & Excellence*, 5, 59-66.

- Hardy, L., Arthur, C. A., Jones, G., Shariff, A., Munnoch, K., Isaacs, I., & Allsopp, A. J. (2010). The relationship between transformational leadership behaviors, psychological, and training outcomes in elite military recruits. *The Leadership Quarterly, 21*, 20-32.
- Helsen, W. F., Starkes, J. L., & Van Winckel, J. (1998). The influence of relative age on success and dropout in male soccer players. *American Journal of Human Biology, 10*, 791-798.
- Hockey Canada. (n.d.). *Male to female branch registration comparison*. Retrieved from <https://cdn.hockeycanada.ca/hockey-canada/Hockey-Programs/Female/Downloads/Male-to-Female-Branch-Registration-Comparison.pdf>
- Hockey Canada. (2017a). *Hockey Canada annual report July 2016-June 2017*. Retrieved from <https://cdn.hockeycanada.ca/hockey-canada/Corporate/About/Downloads/2016-17-annual-report-e.pdf>
- Hockey Canada. (2017b). *By-laws regulation history*. Retrieved from https://cdn.hockeycanada.ca/hockey-canada/Corporate/About/Downloads/2017_18_articles_bylaws_e.pdf
- Holmes, R. M., McNeil, M., & Adorna, P. (2010). Student athletes' perceptions of formal and informal team leaders. *Journal of Sport Behavior, 33*, 442-465.
- Kang, J., Hong, J., Esie, P., Bernstein, K. T., & Aral, S. (2017). An illustration of errors in using the p value to indicate clinical significance or epidemiological

- importance of a study finding, *Sexually Transmitted Diseases*, 44(8), 495-497.
- Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.).
New York: Guilford Press.
- Kuhn, P., & Weinberger, C. (2005) Leadership skills and wages. *Journal of Labor Economics*, 18(3), 395-436.
- Landis, R. S., James, L. R., Lance, C. E., Pierce, C. A. Rogelber, S. R. (2014). When is nothing something? Editorial for the null results special issue of Journal of Business and Psychology. *Journal of Business and Psychology*, 29(2), 163-167.
- Larson, R. (2000). Toward a psychology of positive youth development. *American Psychologist*, 55(1), 170-183.
- Larson, R., Hansen, D., & Moneta, G. (2006). Differing profiles of developing experiences across types of organized youth activities. *Developmental Psychology*, 42(5), 849-863.
- Lemez, S., Baker, J., Horton, S., Wattie, N., & Weir, P. (2014). Examining the relationship between relative age, competition level, and dropout rates in male youth ice-hockey players. *Scandinavian Journal of Medicine & Science in Sports*, 24(6), 935-942.
- Loughead, T. M. (2017). Athlete leadership: A review of the theoretical, measurement, and empirical literature. *Current Opinion in Psychology*, 16, 58-61.
- Loughead, T. M., & Hardy, J. (2005). An examination of coach and peer leader behaviors in sport. *Psychology of Sport and Exercise*, 6, 303-312.

- Loughead, T. M., Hardy, J., & Eys, M. A. (2006). The nature of athlete leadership. *Journal of Sport Behavior, 29*, 142-158.
- Musch, J., & Grondin, S. (2001). Unequal competition as an impediment to personal development: A review of the relative age effect in sport. *Developmental Review, 21*, 147-167.
- Myers, R. (1990). *Classical and modern regression with applications* (2nd ed.). Boston: Duxbury.
- Paradis, K. F., & Loughead, T. M. (2012). Examining the mediating role of cohesion between athlete leadership and athlete satisfaction in youth sport. *International Journal of Sport Psychology, 43*, 117-136.
- Smith, K. L., & Weir, P. L. (2013). An examination of the relative age effect in developmental girls' hockey in Ontario. *High Ability Studies, 24*(2), 171-184.
- Smith, K. L., Weir, P. L., Till, K., Romann, M., & Cobley, S., (2018). Relative age effects within female sport contexts: A systematic review and meta-analysis. *Sports Medicine, 48*(6), 1451-1478.
- Stenling, A., & Holmström, S. (2014). Evidence of relative age effects in Swedish women's ice hockey. *Talent Development & Excellence, 6*(1), 31-40.
- Stevens, J. P. (2009). *Applied multivariate statistics for the social sciences* (5th ed.). New York: Taylor & Francis Group.
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Boston:

Pearson.

Thompson, A. H., Barnsley, R. H., & Dyck, R. J. (1999). A new factor in youth suicide:

The relative age effect. *Canadian Journal of Psychiatry, 44*(1), 82-85.

Vincer, D. J. E., & Loughhead, T. M. (2010). The relationship between athlete leadership

behaviors and cohesion in team sports. *The Sport Psychologist, 24*, 448-467.

Voelker, D. K., Gould, D., & Crawford, M. J. (2011). The experience of high school

sport captains. *The Sport Psychologist, 25*, 47-66.

Wattie, N., Baker, J., Cobley, S., & Montelpare, W. J. (2007). A historical examination of

relative age effects in Canadian hockey players. *International Journal of Sport*

Psychology, 38(2), 178-186.

Wattie, N., Tietjens, M., Cobley, S., Schorer, J., Baker, J., & Kurtz, D. (2014). Relative

age- related participation and dropout trends in German youth sports clubs.

European Journal of Sport Science, 14, S213-S220.

Wattie, N., Schorer, J., & Baker, J. (2015). The relative age effect in sport: A

developmental systems model. *Sports Medicine, 45*(1), 83-94.

Weir, P. L., Smith, K. L., Paterson, C., & Horton, S. (2010). Canadian women's ice

hockey - evidence of a relative age effect. *Talent Development & Excellence,*

2(2), 209-217.

CHAPTER 3
YOUTH DEVELOPMENTAL EXPERIENCES AMONG FEMALE HOCKEY
PLAYERS: THE ROLE OF RELATIVE AGE⁸

Introduction

Within Canada, approximately 86% of youth aged 6 to 17 years participate in extracurricular activities, with sport being the most common (Guèvremont, Findlay, & Kohen, 2008). This is promising, given that sport is considered a structured voluntary activity that can foster initiative; a key component of positive youth development (PYD) in our society, as well as a foundational requirement for other elements of positive development (e.g., creativity, leadership, civic involvement; Larson, 2000). Participation in sport can result in positive (e.g., weight control, leadership skills) and negative outcomes (e.g., overuse injuries, aggression) regarding physical health, and psychological and social development (Côté & Fraser-Thomas, 2011). However, in order to experience the potential benefits associated with sport engagement, programming must be carefully designed and implemented. The ubiquitous use of cut-off dates to group athletes can subvert positive outcomes by causing relative age disparities among athletes. These age differences can result in relative age effects (RAEs), which are characterized by advantages afforded to those born shortly after an imposed cut-off date compared to those born later in the selection period (Barnsley, Thompson, & Barnsley, 1985). A traditional RAE pattern can be visualized as a negative linear relationship between participation

⁸ This chapter represents an edited version of the following manuscript: Chittle, L. Dixon, J. C., & Horton, S., (2019). Youth developmental experiences among female hockey players: The role of relative age. *Journal of Youth Development*, 14(4), 83-100.

rates and month of birth. For example, in sports that use a January 1st cut-off date, we tend to observe more athletes with birthdays in the earlier months of the year and fewer born in later months.

Within sport, relative age can influence one's likelihood of being identified as talented but may also limit access to resources such as higher-level training and coaches, particularly for those who are relatively younger (Helsen, Starkles, & Van Winckel, 1998). Disparities in relative age can cause athletes born later in the year to experience more frequent failure and feelings of inferiority, leading to lower perceptions of competence and self-worth (Delorme, Boiché, & Raspaud, 2010). These negative experiences and lower self-perceptions can result in increased cessation of relatively younger athletes from sport (e.g., Delorme et al., 2010; Lemez, Baker, Horton, Wattie, & Weir, 2014). The dropout of relatively younger athletes can undermine sport as an opportunity to ensure PYD and reduces the talent pool of athletes to select from, which can decrease the likelihood of developing elite athletes (Andronikos, Elumaro, Westbury, & Martindale, 2016). Furthermore, this trend suggests that relatively older and younger athletes may be experiencing sport differently. Important insights can be gained from examining how youth developmental experiences may differ across athletes of different relative ages, as this information can be used to inform RAE theories and sport development programs.

Literature Review

Relative Age Effects and Developmental Experiences in Sport

Positive youth development is a broad term that describes “strength-based and asset-building approaches to developmental research in which youth are viewed as ‘resources to be developed’ rather than ‘problems to be solved’” (Holt, Sehn, Spence, Newton, & Ball, 2012, p. 98). Within the literature, there have been many conceptualizations and frameworks used to measure PYD (Holt et al., 2017; Holt et al., 2012), including the “Five C’s” model (Lerner et al., 2005) and domains of learning or “growth experiences” (Dworkin, Larson, & Hansen, 2003; Larson, Hansen, & Moneta, 2006). These approaches to PYD have been applied to sport but were not developed within a sport context (Holt et al., 2017). To address this gap in the literature, Holt et al. (2017) created a model of PYD for sport. This model has three categories, including PYD climate (adult relationships, peer relationships, and parent involvement), life skills program focus (life skill building activities and transfer activities), and PYD outcomes (personal, social, and physical domains), and includes both implicit and explicit processes to PYD (see Holt et al., 2017 for more details). This model recognizes that individuals’ characteristics (e.g., socio-demographic factors, traits, and dispositions) can influence athletes’ development of PYD outcomes. Relative age is one demographic factor that may affect the attainment of PYD outcomes in athletes.

The current study is informed by Dworkin et al.’s (2003) framework of growth experiences, which are those “that teach you something or expand you in some way, that give you new skills, new attitudes, or new ways of interacting with others” (p. 20). This conceptualization led to the creation of the Youth Experience Survey (YES 1.0; Hansen & Larson, 2002) and later the YES 2.0 (Hansen & Larson, 2005), which were designed to measure youth developmental experiences in a variety of activities. Testing of the YES

2.0 across various structured contexts (e.g., faith-based activities, performance and fine arts activities, and sports) indicated that sport participation is associated with both positive and negative experiences (Larson et al., 2006). Issues with the psychometric properties of the YES 2.0 in sport contexts (e.g., Strachan, Côté, & Deakin, 2009) led to the creation of the Youth Experience Survey-Sport (YES-S; MacDonald, Côté, Eys, & Deakin, 2012). The YES-S measures five dimensions of developmental experiences in sport: personal and social skills, cognitive skills, goal setting, initiative, and negative experiences.

Few studies have examined the impact of relative age on youth developmental experiences in sport. Edwards and O'Donoghue (2014) reported relatively younger netball players having similar experiences to their older peers (e.g., making friends, parental support), but also more negative sporting experiences. To the best of our knowledge, Hancock (2016) was the first to investigate if developmental experiences of female soccer players varied by relative age. The findings suggested no differences in coach-rated competence, peer-rated competence, sport confidence, connection to coach, and character across the relative ages of athletes. Shortly thereafter, Chittle, Horton, Weir, and Dixon (2017) examined if developmental sporting experiences (as measured by the YES-S) differed by quartile of birth among male house league ice hockey players. Their findings suggested that players' experiences did not differ by relative age. This study targeted recreational sport (where RAEs are uncommon), which may facilitate different types of experiences than in competitive sport, and excluded female samples, where the RAE trend is often non-linear (e.g., Hancock, 2017). Despite these findings suggesting male ice hockey players' experiences are not negatively affected by their date

of birth, little (if anything) is known about how relative age may influence female athletes in competitive sport contexts.

Wattie, Sornberger, and Fraser-Thomas (2018) investigated the relationship between relative age and developmental experiences (measured by the YES-S) in sport among youth within three Canadian provinces. While they found significantly more relatively older athletes, there were no differences for any of the YES-S subscales across relative age or differences in developmental experiences between males and females. Although this study utilized a large and geographically diverse sample ($n = 776$), it did not focus on one particular sport, which may have confounded their findings. As a result, these authors suggested future research may benefit from targeting a specific sport. Conversely, Smith and Weir (2018) demonstrated that commitment to learning and positive values (two internal assets) significantly separated athletes born in the first half of the year versus the second half. In this case, relatively younger athletes reported higher commitment to learning and positive values than their relatively older peers. This finding provides some support that the relatively youngest may not always be disadvantaged in terms of their developmental experiences.

Relative Age Effects in Female Ice Hockey

Male ice hockey has consistently been a popular focus for RAE studies (e.g., Cogley, Baker, Wattie, & McKenna, 2009). While growing in interest among researchers, there continues to be comparatively fewer investigations on female hockey (Smith, Weir, Till, Romann, & Cogley, 2018). At the elite level, Wattie, Baker, Cogley, and Montelpare (2007) demonstrated no RAE among Canadian female national championship players.

Shortly thereafter, Weir, Smith, Paterson, and Horton (2010) extended Wattie et al.'s work by including national and international players and found more athletes born in the first half of the year (60%) compared to the second half of the year (40%). Within interuniversity sport, RAEs have been found (with a peak in quartile⁹ two) among female ice hockey players (Chittle, Horton, & Dixon, 2015; Geithner, Molenaar, Henriksson, Fjellman-Wiklund, & Gilenstam, 2018). Outside of a North American context, significant linear RAE patterns are present among elite and junior elite Swedish women's hockey players (Stenling & Holmström, 2014). Within Stenling and Holmström's study, the RAE profile resembles that of male ice hockey, characterized by a progressive decline in participation rates from quartiles one through four. More recently, Geithner et al. (2018) found no RAE among elite Swedish players, which conflicts with the findings of Stenling and Holmström. Geithner et al. attributed these differences to a smaller, older, and narrower age range of participants who competed in the highest senior league.

Across developmental female ice hockey, RAEs have been frequently documented among those in pre- and post-pubescent age categories (Hancock, 2017; Hancock, Seal, Young, Weir, & Ste-Marie, 2013; Smith & Weir, 2013; Stenling & Holmström, 2014). Smith and Weir (2013) utilized population data from the Ontario Women's Hockey Association and found significant differences between the observed birthdate distribution of players and what would be expected based upon an equal birth distribution across quartiles for the Novice (≤ 8 years) through Midget (≤ 17 years) age

⁹ A quartile refers to one of four approximately equal time periods of a calendar year based upon a pre-determined selection date. For example, when relying on a January 1st cut-off date, quartile 1 would consist of the months of January, February, and March; quartile 2 comprises the months of April, May, and June; and so forth.

divisions. Among pre-pubescent female ice hockey players, Hancock et al. (2013) found significant RAEs, with most age categories having the highest overrepresentation of athletes in quartile two. Generally, across these studies, there were more relatively older players than younger players, with quartile two often being the most over-represented birth quartile. Similar findings were seen among female Ontario Hockey Federation (OHF) players from novice to Midget (Hancock, 2017).

Contrary to male ice hockey, most studies of female ice hockey players find the largest proportion of athletes born in quartile two rather than a gradual decline from quartiles one to four (e.g., Hancock, 2017). Proposed hypotheses for this quartile two overrepresentation include quartile one athletes competing in traditionally stereotyped female sports such as swimming (Hancock et al., 2013), and the lack of body checking in female ice hockey, which may lead coaches to select athletes based upon other criteria than physical size (Hancock, 2017). Another proposed explanation is that relatively older female athletes may be competing in male leagues. However, Hancock (2017) demonstrated that quartile two female players were also the most overrepresented among girls competing within boys' ice hockey leagues across multiple age divisions.

The frequency of RAEs within competitive female ice hockey may be a consequence of the considerable growth in the number of female ice hockey registrants over the last 25 years (Hockey Canada, 2017, n.d.), leading to greater competition among players for positions on elite teams. Specifically, Ontario female registration rates in ice hockey have increased 10-fold from the 1993-1994 to 2016-2017 seasons (Hockey Canada, 2017, n.d). Given this considerable growth in participation, female ice hockey

serves as a fruitful avenue to explore how relative age influences participation rates and whether developmental outcomes differ by quartile of birth.

Consequences of RAEs

Talent development experts indicate that physically precocious athletes are more commonly selected for teams and that RAEs can create a skewed learning opportunity for relatively younger athletes, particularly when there is a win orientation rather than a focus on long-term athlete development (Andronikos et al., 2016). For instance, relatively younger female netball players reported differing experiences than their relatively older peers, including performance attrition motives (e.g., negative experiences in training/matches, negative self-perceptions) and social attrition motives (e.g., conflicts, feelings of not belonging; Edwards & O'Donoghue, 2014). These younger participants also indicated feeling isolated as a result of de-selection and non-selection and perceived that coaches favoured relatively older players. Furthermore, the relatively youngest recalled having to work harder than their older peers in order to be accepted and identified as talented.

Despite findings that suggest relatively younger athletes may experience more negative sporting environments and higher dropout rates (e.g., Delorme et al., 2010), there is a mounting body of literature suggesting paradoxical trends where relatively younger athletes become higher quality and more sought after (Wattie, MacDonald, & Cogley, 2015). This phenomenon has been termed the “underdog hypothesis” (Gibbs, Jarvis, & Dufur, 2011). Fumarco, Gibbs, Jarvis, and Rossi (2017) suggest that RAEs in ice hockey may initially advantage relatively older players in youth leagues, but if the

relatively youngest can overcome these disadvantages and ascend to the professional level, they will perform better than their relatively older peers. Possible reasons for this “RAE reversal” may include psychological factors such as superior resiliency (e.g., Fumarco et al., 2017; McCarthy & Collins, 2014) to overcome being less physically mature, as well as having greater ability and talent than their relatively older peers (e.g., Ashworth & Heyndels, 2007; Fumarco et al., 2017).

Despite the large body of literature exploring the existence of RAEs in sport, there have been comparatively few studies targeting the implication of relative age on psychosocial outcomes (e.g., PYD, leadership). Chittle et al. (2017) expanded this line of inquiry by investigating differences in youth developmental experiences across quartile of birth, but only utilized a male sample. While Wattie et al. (2018) conducted similar work in this area, there is merit in targeting one sport, given that developmental experiences may be vastly different across activities. Therefore, the purpose of this study was to determine if the positive and negative sporting experiences of competitive female ice hockey players differ across quartile of birth. Conducting this study will advance the literature by providing a more holistic perspective on the implications of relative age on youth developmental experiences.

Method

Sample and Recruitment

Competitive Canadian female ice hockey players (mean approximately 16 years, range: 15-18 years) were recruited for this study from ice hockey tournaments within the province of Ontario as well as through attending team practices and/or games in 2017-

2018¹⁰. For this study, participants were considered to play competitive (i.e., rep/travel) ice hockey when there was an element of coach selection in order to make the team. Data were collected through an online survey (hosted by Qualtrics) where participants were asked to respond to the YES-S (MacDonald et al., 2012), provide demographic information, as well as provide details regarding their prior experiences in ice hockey. This research received clearance from the authors' institutional Research Ethics Board.

Youth Experience in Sport Survey (YES-S)

The YES-S (MacDonald et al., 2012) is a 37-item questionnaire that measures five dimensions of positive and negative developmental experiences in sport. The four positive scales include the dimensions of personal and social skills (14 items; e.g., “I became better at sharing responsibility”), cognitive skills (five items; e.g., “I improved skills for finding information”), goal setting (four items; e.g., “I set goals for myself in this activity”), and initiative (four items; e.g., “I learned to push myself”). The single negative dimension is negative experiences (10 items; e.g., “This activity has stressed me out”). Items are measured on a 4-point Likert scale anchored from 1 (Not at all) to 4 (Yes, definitely). Mean scores for each sub-scale were calculated for each participant. Items were modified slightly to ensure appropriate comprehension by participants. The YES-S has been used to measure developmental experiences in youth samples (e.g., Chittle et al., 2017; Cronin & Allen, 2015) and has been reported to have acceptable

¹⁰ G*Power 3, a power analysis program, was used to predict the sample size we needed to ensure sufficient power (Faul, Erdfelder, Lang, & Buchner, 2007). We calculated an anticipated effect size for a global-effects one-way MANOVA test based upon a modest Pillai's Trace (V) equal to 0.1, four groups (i.e., quartiles of birth), and five response variables (i.e., five dimensions of the YES-S). This resulted in an effect size equal to 0.034. Based on this effect size, power = 0.8, and alpha = 0.05, a minimum sample of 192 was required (i.e., 48 participants born in each quartile).

internal consistency values (e.g., Bruner et al., 2017; Cronin & Allen, 2015).

Furthermore, the model has been found to have adequate fit among nine- to 19-year-old athletes from various recreational and competitive sports, with ice hockey being the most represented (MacDonald et al., 2012). Cronbach's alpha (α) scores were calculated to measure the internal consistency of the dimensional subscales.

Data Analysis

Like Chittle et al. (2017), the sample was delimited to include participants who answered a minimum of 80% of the YES-S items and who provided their date of birth to ensure their relative ages could be determined. Four participants were removed from our sample because they did not provide their date of birth, resulting in our final sample comprising 264 participants. Upon inspection of the data there was only one missing data point from the YES-S which was replaced using case mean substitution (El-Masri & Fox-Wasylyshyn, 2005).

Determining a RAE

In Canada, Midget female ice hockey comprises players of three age-cohorts (15, 16, and 17 years as of age). Participants were grouped into quartiles based upon the month they were born relative to Hockey Canada's cut-off date of December 31st (Hockey Canada, 2018), irrespective of their absolute age. As a result, quartile one contained those individuals born in January, February, and March, quartile two included those born in April, May, and June, and so forth. This is consistent with how previous research has categorized players into birth quartiles for age divisions that span multiple years (e.g., Geithner et al., 2018; Hancock et al., 2017). Two chi-square goodness of fit

tests (χ^2) were used to determine if there were significant differences between the birth distribution of our sample with (a) Canadian population birth rates from 2000-2002 and (b) the Midget (15-17 years) female birthdate distribution derived from the Ontario Hockey Federation (Hancock, 2017).

Relative Age and Youth Developmental Experiences

A multivariate analysis of variance (MANOVA) was performed to determine if youth developmental experiences varied across athletes of different relative ages. For the purpose of this analysis, birth quartile served as the independent variable (i.e., four birth quartiles) and the five YES-S dimensions were the dependent variables. All statistical assumptions regarding univariate and multivariate outliers, multicollinearity, univariate and multivariate normality, and homogeneity of covariance were tested. Five outliers were found within this sample and Winsorizing was used to replace these values with the next lowest (non-outlier point; Field, 2013) for the appropriate dependent variable. All other multivariate assumptions were met. Absolute age and the number of years athletes participated in organized hockey were considered as potential covariates, but were not sufficiently correlated with the dependent variables to be included within the analysis.

Results

Relative Age Effect

Within our sample, there was a negative relationship between the birth quartile and competitive ice hockey participation rates. There were 77 (29.2%) athletes born in quartile one, 73 (27.7%) in quartile two, 63 (23.9%) in quartile three, and 51 (19.3%) in

quartile four. When relying on Canadian population birth rates as the expected distribution, the chi-square goodness of fit test was not significant ($\chi^2 = 4.952$, $df = 3$, $p = 0.175$; see Figure 2). When utilizing the OHF birthdate distribution (Hancock, 2017), the chi-square goodness of fit test also failed to reach statistical significance ($\chi^2 = 2.029$, $df = 3$, $p = 0.566$; see Figure 2). Although these chi-square tests were not significant, there is still a defined RAE pattern within this sample.

Internal consistency values ranged between 0.56 and 0.83. Initiative and goal setting did not meet the 0.7 threshold (Nunnally & Bernstein, 1994), but this is likely a result of these subscales containing only four items. Alpha is known to be a function of the number of items in a scale and should be interpreted with this in mind (Cortina, 1993). The results of the MANOVA test suggested no multivariate differences between quartile of birth and the YES-S measures (Wilks' Lambda = 0.940, $F(15, 707.105) = 1.061$, $p = 0.390$, $\omega^2_{\text{mult}} = 0.049$)¹¹. Therefore, it appears that quartile of birth does not differentiate youth developmental experiences. See Table 4 for a summary of the YES-S scores across quartile of birth.

Discussion

The primary purpose of this research project was to explore the influence of relative age on positive and negative developmental experiences among post-adolescent competitive female ice hockey players. Our results indicated that competitive female ice

¹¹ Please note, the MANOVA was also conducted by removing the initiative and goal setting subscales and grouping athletes by halves of the year and the results were still not significant. We also explored deleting items to improve the reliability of the goal setting and initiative sub-scales. For goal setting, deleting one item would have very slightly improved the reliability, but it still did not reach 0.7. For initiative, deleting any of the items would have reduced the reliability score.

hockey players are experiencing the sport in a similar manner, regardless of their quartile of birth, supporting the work of Chittle et al. (2017) and Wattie et al. (2018). These null results may be positive findings when considering the reports of greater dropout rates among relatively younger athletes (e.g., Lemez et al., 2014) and qualitative anecdotes of more negative sporting experiences among the relatively youngest (Edwards & O'Donoghue, 2014). When examining mean scores across sub-scales, negative experiences ($M = 1.91$, $SD = 0.52$) were the least commonly reported, while initiative received the highest scores ($M = 3.63$, $SD = 0.36$). Athletes rating initiative as the highest outcome is a promising finding given that it is a core condition for other aspects of positive development (Larson, 2000).

Possible explanations for our null results may include relying on a sample of adolescent (age 15-18 years) ice hockey players who are still actively participating at a competitive level. The nature of this study targeted current players, which may have confounded our results as these athletes likely have continued competing in sport due to their previous sporting success (e.g., skill development) and enjoyable experiences. For example, athletes within this study reported playing competitive ice hockey for an average of 7.79 years. Thus, it is hypothesized that these athletes have experienced positive outcomes associated with sport (e.g., skill development, social relationships); otherwise, they may have already dropped out. It is possible that different responses may have been gathered if we had surveyed former players or younger athletes who have not been involved in ice hockey for an extended period of time.

Moreover, research suggests that the relatively youngest athletes may overcome systematic disadvantages related to their birthdate due to superior resiliency (e.g.,

Fumarco et al., 2017). It is possible that our sample may consist of relatively younger athletes who possess this trait and, therefore, perceive themselves as having similar positive and negative developmental experiences as their older peers. Future studies would benefit from including a measurement of resiliency or other characteristics (e.g., motivation) aligning with the “underdog hypothesis” when examining the influence of relative age on psychological outcomes. While the YES-S was designed to measure experiences specific to sport, it was adapted (including some modifications to items) from the YES 2.0, which would have contained concepts that apply to multiple structured activities. It is possible that this study saw no differences in experiences across birth quartiles because items may not resonate with athletes in all sports. With respect to the current study, items within the cognitive subscale (e.g., improved computer/internet skills) may not relate to ice hockey athletes as these skills are likely not required. In fact, the cognitive domain had the lowest mean scores of the positive subscales ($M = 2.41$, $SD = 0.67$).

This study found an under-representation of female ice hockey players born later in the year. Despite this finding failing to reach statistical significance, a traditional RAE pattern was still present. In fact, when comparing across similar (Midget) age divisions, our study had a greater proportion of athletes born in the first six months of the year (56.8%) than other studies conducted by Smith and Weir (2013; 54.4%) and Hancock (2017; 54.14%), both of which had significant findings. Their significant results may be partly explained by their comparatively larger sample sizes, which are more inclined to achieve small p-values (Kang, Hong, Esie, Bernstein, & Aral, 2017). Unlike prior RAE

studies in female sport (e.g., Geithner et al., 2018), our RAE pattern was linear with no over-representation in quartile two.

Implications for Professional Practice

The results of this study suggest that female ice hockey players who maintain their participation in travel/rep hockey will experience positive developmental outcomes, regardless of their relative age. Past research illustrates that RAEs are present within pre- and-post adolescent female ice hockey, suggesting that relatively younger athletes are facing participatory disadvantages as early as Novice (ages 7 to 8) and that these disadvantages persist across age divisions (Hancock, 2017). Thus, relative age can undermine athletes' opportunities to get into the sport system, which may compromise their abilities to experience PYD through sport. From a talent development perspective, it could be argued that coaches and talent scouts are overlooking and/or limiting the talent pool of athletes by not addressing the RAE in female ice hockey. As such, it is imperative for sport administrators to take an active role in creating an environment that affords equal opportunity to engage in travel/rep hockey throughout the developmental period. In doing so, this will help maximize the talent pool of female ice hockey players.

A number of solutions have been proposed to minimize RAEs in order to provide equitable sporting opportunities. These have included rotating cut-off dates, educating stakeholders, implementing quota systems, and reducing the size of age-cohorts (Barnsley & Thompson, 1988; Musch & Grondin, 2001). Despite the considerable number of proposed solutions, most of these have failed to garner the support or attention of policy makers and sport practitioners, perhaps due to logistical difficulties or lack of

awareness. Prior research suggests that changing the annual cut-off date will only shift the (dis)advantage associated with the RAE (Helsen, Starkes, & Van Winckel, 2000); however, this has been a prescribed solution to address RAE inequities by organizations such as U.S. Soccer (U.S. Soccer, 2017). This example highlights an important misunderstanding that sport administrators have regarding how to solve the RAE problem and a possible disconnect between researchers and practitioners.

Beyond the aforementioned solutions to the RAE, to help address (dis)advantages associated with age-cohorts, researchers have collaborated with the English Premier League to implement bio-banded soccer tournaments. At these tournaments, athletes are grouped based upon biological maturity rather than age to help address maturational differences across athletes grouped by chronological age, and to provide a diverse and developmentally appropriate learning environment (see Cumming, Lloyd, Oliver, Eisenmann, & Malina, 2017 for more details). Other interventions such as age-ordered shirt numbering aligning with the relative ages of players have been shown to eliminate selection bias among scouts (Mann & van Ginneken, 2017). Similarly, incorporating corrective adjustments that account for athletes' birthdates in timed sports such as sprinting (Romann & Cogley, 2015) is another promising approach to mitigating RAEs.

In order to ensure female players reap the positive outcomes associated with ice hockey participation, sport administrators must design a sport environment that minimizes participatory disadvantages associated with relative age. This may include implementing some of the proposed solutions described above or through attempts to change the culture of ice hockey to focus on long-term athlete development (i.e., focus on physical and mental skills) rather than winning (Andronikos et al., 2016). This would

involve educating and encouraging coaches to look beyond team success and prioritizing long-term development. Delaying selection and streaming for late developers (who are likely relatively younger) and providing opportunities for their participation would help reduce relative age inequities (Andronikos et al., 2016). Furthermore, educating coaches and scouts about RAEs and what “talent” is from a long-term development perspective, including what elements to examine and what skills they should strive to develop, is an important step in minimizing RAEs (Andronikos et al., 2016).

Limitations and Future Directions

Within the current study, the subscales of initiative and goal setting fell below the 0.7 standard for internal consistency values. Given that alpha values are influenced by the number of items within a scale (Cortina, 1993), future research may benefit from expanding the YES-S questionnaire to include additional items within subscales. The YES-S was developed within multiple sport types at both recreational and competitive levels (MacDonald et al., 2012) and illustrated promising psychometric properties in prior research; however, the low alpha scores found in this study suggest that further work may be required to validate this instrument using one sport (e.g., ice hockey) and one competitive level (e.g., rep sport). Furthermore, the YES-S relies on self-reported responses which opens the possibility for response bias. Additionally, our sample consisted of a small proportion of the overall population (approximately 4.68%) of Midget-aged female ice hockey players in Ontario. Thus, generalizations across female ice hockey as well as other sports and geographic locations should be made with caution. While all participants competed at a competitive (e.g., travel/rep) level, they were from different divisions such as AA, A, BB, B, which may confound findings. In the future,

studies would benefit from targeting one division (ideally consisting of a one-year age span), perhaps at the most elite level, where RAEs are most common. While the vast majority of RAE literature uses birth data as a categorical variable, future research may benefit from treating this variable as continuous.

The current study consisted of post-adolescent female ice hockey players who have maintained their participation in the sport, which suggests they may be reaping the rewards of sport and overcoming negative experiences. Therefore, this may result in a skewed perspective of how relative age influences developmental ice hockey experiences. As a result, it would be beneficial to replicate this study with a sample of female ice hockey players who dropped out of the sport to learn if developmental experiences were a consideration in their cessation. The YES-S is capable of quantifying experiences but does not allow the unique voices of participants to be heard. Therefore, future research should employ qualitative methods to gain an in-depth understanding of the factors and constraints that help all athletes to experience PYD. This type of research design would also provide an opportunity to explore whether resiliency and other psychological factors related to the underdog hypothesis might help relatively younger athletes maintain their involvement and ascend the sporting ranks.

Conclusion

This study was exploratory and provides initial evidence that competitive female ice hockey players report having similar developmental experiences, regardless of their relative age. It appears that competitive ice hockey may provide an equitable platform for female athletes to develop transferable skills and experience personal growth, so long as

they remain involved in the sport. Exploring mechanisms (e.g., psychological factors, relationships with coaches) that may help explain how relatively younger athletes may overcome systematic age biases and experience comparable developmental experiences warrants further investigation.

REFERENCES

- Andronikos, G. Elumaro, A. I., Westbury, T., & Martindale, R. J. J. (2016). Relative age effect: Implications for effective practice. *Journal of Sports Sciences, 34*, 1124-1131.
- Ashworth, J., & Heyndels, B. (2007). Selection bias and peer effects in team sports: The effect of age grouping on earnings of German soccer players. *Journal of Sports Economics, 8*(4), 355-377.
- Barnsley, R. H., & Thompson, A. H. (1988). Birthdate and success in minor hockey: The key to the NHL. *Canadian Journal of Behavioural Science, 20*(2), 167-176.
- Barnsley, R. H., Thompson, A. H., & Barnsley, P. E. (1985). Hockey success and birthdate: The RAE. *Canadian Association for Health, Physical Education, and Recreation, 51*, 23-28.
- Bruner, M. W., Balish, S. M., Forrest, C., Brown, S., Webber, K., Gray, E., . . . Shields, C. A. (2017). Ties that bond: Youth sport as a vehicle for social identity and positive youth development. *Research Quarterly for Exercise and Sport, 88*(2), 209-214.
- Chittle, L., Horton, S., & Dixon, J. C. (2015). Exploring the relative age effect in Canadian interuniversity ice hockey. *Talent Development & Excellence, 7*(1), 69-81.

- Chittle, L., Horton, S., Weir, P., & Dixon, J. C. (2017). Exploring the relationship between relative age effect and youth development among male recreational ice hockey players. *Journal of Amateur Sport*, 3(1), 79-95.
- Cobley, S., Baker, J., Wattie, N., & McKenna, J. M. (2009). Annual age-grouping and athlete development: A meta-analytic review of relative age effects in sport. *Sports Medicine*, 39(3), 235-256.
- Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology*, 78(1), 98-104.
- Côté, J., & Fraser-Thomas, J. (2011). Youth involvement and positive development in sport. In P. R. E. Crocker (Ed.). *Sport and exercise psychology: A Canadian perspective*, (2nd ed., pp. 226-255). Toronto, ON: Pearson Prentice Hall.
- Cronin, L. D., & Allen, J. B. (2015). Developmental experiences and well-being in sport: The importance of the coaching climate. *The Sport Psychologist*, 29, 62-71.
- Cumming, S. P., Lloyd, R. S., Oliver, J. L., Eisenmann, J. C., & Malina, R. M. (2017) Bio-banding in sport: Applications to competition, talent identification, and strength and conditioning of youth athletes. *Strength and Conditioning Journal*, 39(2), 34-47.
- Delorme, N., Boiché, J., & Raspaud, M. (2010). Relative age effect in female sport: A diachronic examination of soccer players. *Scandinavian Journal of Medicine & Science in Sports*, 20, 509-515.

- Dworkin, J. B., Larson, R., & Hansen, D. (2003). Adolescents' accounts of growth experiences in youth activities. *Journal of Youth and Adolescence*, 32(1), 17–26.
- Edwards, L., & O'Donoghue, P. G. (2014). Relative age effect in netball: A qualitative investigation. *International Journal of Coaching Science*, 8(1), 47-68.
- El-Masri, M., & Fox-Wasylyshyn, S. (2005). Missing data: An introductory overview for the novice researcher. *Canadian Journal of Nursing Research*, 37(4). 156-171.
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175-191.
- Field, A. (2013). *Discovering statistics using IBM SPSS Statistics*. (4th ed.). Thousand Oaks, CA: Sage.
- Fumarco, L., Gibbs, B. G., Jarvis, J. A. Rossi, G. (2017). The relative age effect reversal among National Hockey League elite. *PLoS ONE*, 12(8), e0182827.
- Geithner, C. A., Molenaar, C. E., Henriksson, T., Fjellman-Wiklund, A., Gilenstam, K. (2018). Relative age effects in women's ice hockey: Contributions of body size and maturity status. *Women in Sport and Physical Activity Journal*, 26, 124-133.
- Gibbs, B. G., Jarvis, J. A., & Durfur, M. J. (2011). The rise of the underdog? The relative age effect reversal among Canadian-born NHL hockey players: A reply to Nolan and Howell. *International Review for the Sociology of Sport*, 47(5), 644-649.

- Guèvremont, A., Findlay, L., & Kohen, D. (2008). Organized extracurricular activities of Canadian children and youth. *Health Reports/ Statistics Canada, Canadian Centre for Health Information, 19*(3), 65-69.
- Hancock, D. J. (2016). Relative age effects and positive youth development. *Journal of Sport & Exercise Psychology, 38*, S199.
- Hancock, D. (2017). Female relative age effects and the second-quartile phenomenon in young female ice hockey players. *Psychology of Sport and Exercise, 32*, 12-16.
- Hancock, D. J., Seal, K., Young, B. W., Weir, P. L., & Ste-Marie, D. M. (2013). Examining mechanisms that contribute to relative age effects in pre-pubescent female ice hockey players. *Talent Development & Excellence, 5*, 59-66.
- Hansen, D. M., & Larson, R. (2002). *The youth experience survey 1.0: Instrument development and testing*. Unpublished manuscript, University of Illinois at Urbana-Champaign. Retrieved from <http://youthdev.illinois.edu/wp-content/uploads/2013/11/YES-1.0-Instrument.pdf>
- Hansen, D. M., & Larson, R. (2005). *The youth experience survey 2.0: Instrument revisions and validity testing* (Unpublished manuscript). University of Illinois at Urbana-Champaign. Retrieved from <http://youthdev.illinois.edu/wp-content/uploads/2013/11/YES-2.0-Instrument.pdf>
- Helsen, W. F., Starkes, J. L., & Van Winckel, J. (1998). The influence of relative age on success and dropout in male soccer players. *American Journal of Human Biology, 10*, 791-798.

- Helsen, W. F., Starkes, J. L., & Van Winckel, J. (2000). Effect of change in selection year on success in male soccer players. *American Journal of Human Biology*, *12*(6), 729-735.
- Hockey Canada. (n.d.). Male to female branch registration comparison. Retrieved from <https://cdn.hockeycanada.ca/hockey-canada/Hockey-Programs/Female/Downloads/Male-to-Female-Branch-Registration-Comparison.pdf>
- Hockey Canada. (2017). Hockey Canada annual report July 2016-June 2017. Retrieved from <https://cdn.hockeycanada.ca/hockey-canada/Corporate/About/Downloads/2016-17-annual-report-e.pdf>
- Hockey Canada. (2018). By-laws regulation history. Retrieved from <https://cdn.hockeycanada.ca/hockey-canada/Corporate/About/Downloads/2018-19-bylaws-e.pdf>
- Holt, N. L., Neely, K. C., Slater, L. G., Camiré, M., Côté, J., Fraser-Thomas, J., . . . Tamminen, K. A. (2017). A grounded theory of positive youth development through sport based on results from a qualitative meta-study. *International Review of Sport and Exercise Psychology*, *10*(1), 1-49.
- Holt, N. L., Sehn, Z. L., Spence, J. C., Newton, A. S., & Ball, G. D. C., (2012). Physical education and sport programs at an inner city school: Exploring possibilities for positive youth development. *Physical Education and Sport Pedagogy*, *17*(1), 97-113.

- Kang, J., Hong, J., Esie, P., Bernstein, K. T., & Aral, S. (2017). An illustration of errors in using the p value to indicate clinical significance or epidemiological importance of a study finding. *Sexually Transmitted Diseases, 44*(8), 495-497.
- Larson, R. (2000). Toward a psychology of positive youth development. *American Psychologist, 55*(1), 170-183.
- Larson, R. W., Hansen, D. M. & Moneta, G. (2006). Differing profiles of developmental experiences across types of organized youth activities. *Developmental Psychology, 42*(5), 849-863.
- Lemez, S., Baker, J., Horton, S., Wattie, N., & Weir, P. (2014). Examining the relationship between relative age, competition level, and dropout rates in male youth ice-hockey players. *Scandinavian Journal of Medicine & Science in Sports, 24*(6), 935-942.
- Lerner, R. M., Lerner, J. V., Almerigi, J. B., Theokas, C., Phelps, E., Gestsdottir, S, . . . von Eye, A. (2005). Positive youth development, participation in community youth development programs, and community contributions of fifth grade adolescents: Findings from the first wave of the 4-H Study of Positive Youth Development. *Journal of Early Adolescence, 25*(1), 17-71.
- MacDonald, D. J., Côté, J., Eys, M., & Deakin, J. (2012). Psychometric properties of the youth experience survey with young athletes. *Psychology of Sport and Exercise, 13*, 332-340.

- Mann, D. L., & van Ginneken, P. J. M. (2017). Age-ordered shirt numbering reduces the selection bias associated with the relative age effect. *Journal of Sports Sciences*, 35(8), 784-790.
- McCarthy, N., & Collins, D. (2014). Initial identification & selection bias versus the eventual confirmation of talent: Evidence for the benefits of a rocky road? *Journal of Sports Sciences*, 32(17), 1604–1610.
- Musch, J., & Grondin, S. (2001). Unequal competition as an impediment to personal development: A review of the relative age effect in sport. *Developmental Review*, 21, 147-167.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York, NY: McGraw-Hill.
- Romann, M., & Cogley, S. (2015). Relative age effects in athletic sprinting and corrective adjustments as a solution for their removal. *PLoS One*, 10(4), e0122988.
- Smith, K., & Weir, P. (2018, October). Advantage reversals and relative age: Does positive youth development play a role? *Journal of Exercise, Movement, and Sports (A SCAPPS Publication)*, 50(1). Retrieved from <https://www.scapps.org/jems/index.php/1/article/view/1892>
- Smith, K. L., & Weir, P. L. (2013). An examination of the relative age effect in developmental girls' hockey in Ontario. *High Ability Studies*, 24(2), 171-184.

- Smith, K. L., Weir, P. L., Till, K., Romann, M., & Cobley, S., (2018). Relative age effects within female sport contexts: A systematic review and meta-analysis. *Sports Medicine*, 48(6), 1451-1478.
- Stenling, A., & Holmström, S. (2014). Evidence of relative age effects in Swedish women's ice hockey. *Talent Development & Excellence*, 6(1), 31-40.
- Strachan, L., Côté, J., & Deakin, J. (2009) "Specializers" versus "samplers" in youth sport: Comparing experiences and outcomes. *The Sport Psychologist*, 23, 77-92.
- U.S. Soccer. (2017). Five things to know about birth year registration. Retrieved from <https://www.ussoccer.com/stories/2017/08/five-things-to-know-about-birth-year-registration>
- Wattie, N., Baker, J., Cobley, S., & Montelpare, W. J. (2007). A historical examination of relative age effects in Canadian hockey players. *International Journal of Sport Psychology*, 38(2), 178-186.
- Wattie, N., MacDonald, D.J., & Cobley, S. (2015). Birthdate and birthplace effects on expertise attainment. In J. Baker & D. Farrow (Eds.), *The Routledge handbook of sport expertise* (pp. 373-382). London: Routledge.
- Wattie, N., Sornberger, B., & Fraser-Thomas, J. (2018). The influence of relative age on youths' developmental experiences in sport. *Journal of Exercise, Movement, and Sports (A SCAPPS Publication)*, 50(1). Retrieved from <https://www.scapps.org/jems/index.php/1/article/view/1906>

Weir, P. L., Smith, K. L., Paterson, C., & Horton, S. (2010). Canadian women's ice hockey - evidence of a relative age effect. *Talent Development & Excellence*, 2(2), 209-217.

CHAPTER 4

DOES RELATIVE AGE INFLUENCE THE MECHANISMS FOSTERING POSITIVE YOUTH DEVELOPMENT AMONG FEMALE ICE HOCKEY PLAYERS? A QUALITATIVE EXAMINATION¹²

Introduction

Within sport, it is common practice for athletes to be categorized by chronological age (Baker, Schorer, & Cobley, 2010; Musch & Grondin, 2001) to ensure fairness in competition, age appropriate instruction, and safety (Barrow & McGee, 1971; Musch & Grondin, 2001). This process can lead to considerable variation in age among athletes competing for positions on team rosters. These age differences can result in relative age effects (RAEs; Barnsley, Thompson, & Barnsley, 1985), which describe the (dis)advantages experienced by athletes based upon when their birthdates fall relative to an imposed cut-off date. Relatively older athletes are often afforded participation advantages such as more practice and play time, and better competition and coaching (Helsen, Starkes, & Van Winckel, 1998), resulting in accumulated advantages that persist over time. Conversely, relative younger athletes experience more frequent failure and more commonly drop out of sport (Delorme, Boiché, & Raspaud, 2010).

Relative age effects have been demonstrated to exist in many sports and in a range of ages and competitive levels (Cobley, Baker, Wattie, & McKenna, 2009; Smith, Weir, Till, Romann, & Cobley, 2018). However, there are far fewer studies that have examined

¹² This chapter represents an edited version of the following manuscript: Chittle, L., Horton, S., & Dixon, J. C. (Submitted). The impact of relative age on positive youth development among female ice hockey players: A qualitative examination. *Journal of Adolescent Research*.

how relative age influences the positive youth development (PYD) of athletes (e.g., Chittle, Horton, Weir, & Dixon, 2017a; Chittle, Dixon, & Horton, 2019; Hancock 2016; Wattie, Sornberger, & Fraser-Thomas, 2018). To date, most of the RAE literature has been atheoretical and descriptive, leaving a number of areas to be addressed in order to better understand the RAE phenomenon. Despite researchers recognizing the need for qualitative research in order to understand athlete experiences and the underlying mechanisms of the RAE (e.g., Smith & Weir, 2013; Smith et al., 2018; Wattie, Schorer, & Baker, 2015), there have been few studies that have utilized qualitative designs (viz., Andronikos, Elumaro, Westbury, & Martindale, 2016; Edwards & O'Donoghue, 2014; Sherman & Hancock, 2016). As such, this research seeks to address these gaps in the literature by relying on a qualitative approach to investigate how relative age may influence PYD.

Literature Review

The RAE literature has been criticized for being atheoretical (e.g., Cogley et al., 2009). To help address these concerns, two frameworks have been developed to advance this field of research. These include Hancock, Adler, and Côté's (2013) social agents model, which illustrates how the behaviours of parents, coaches, and athletes can perpetuate RAEs, and Wattie, Schorer, et al.'s (2015) developmental systems model, which frames the RAE in terms of three interacting constraints: individual (e.g., sex), task (e.g., sport type), and environmental (e.g., coach influence). Despite the creation of these models, the vast majority of RAE studies are cross sectional and quantitative (Cogley et al., 2009; Smith et al., 2018), testing for the existence of RAEs in different sport environments. To the best of our knowledge there have been only three studies that have

examined the RAE from a qualitative perspective. Edwards and O'Donoghue (2014) examined the experiences of female netball players (ages 24-52) who differed in relative age. Consistent across participants, enjoyment, social benefits such as making friends, competition, and support from parents, family, and friends were key participation motives. Relatively younger players experienced additional performance (e.g., negative experiences in training/matches, negative self-perceptions) and social attrition motives (e.g., conflicts, feelings of not belonging) more often than their relatively older peers and recalled being less coordinated and developed. These relatively younger participants indicated feeling isolated as a result of de-selection and non-selection and perceived that coaches favoured relatively older, more experienced players. Furthermore, they recalled having to work harder in order to be identified as talented. This study suggests that relatively younger and older athletes have differing sport experiences.

The second qualitative study (Andronikos et al., 2016), focused on the perspectives of seven European talent identification experts about the existence, mechanisms, and possible solutions to the RAE. Experts spoke of inconsistencies in the presence of RAEs across sports as well as physical and mental advantages associated with being relatively older. These advantages are exacerbated when there is a win orientation, creating a skewed learning opportunity for relatively younger athletes. However, relatively younger individuals who are selected for sport are provided with additional challenges that can force them to develop psychological characteristics (e.g., perseverance) that prove useful for elite sport.

The third qualitative study consisted of interviews with 10 competitive ice hockey players (14-15 years of age) and 10 parents of players about their awareness and

perceptions of the RAE. While athletes had no prior knowledge of the RAE, parents were aware of this phenomenon. Athletes believed coaches selected players based upon physical characteristics rather than ability, and parents perceived that differences in physical maturation between relatively older and younger athletes perpetuated RAEs (Sherman & Hancock, 2016).

RAEs in Female Ice Hockey

Relative age effects are commonly present within pre-and-post pubescent female ice hockey (e.g., Hancock, 2017; Hancock, Seal, Young, Weir, & Ste-Marie, 2013; Smith & Weir, 2013; Stenling & Holmström, 2014). At elite levels of female ice hockey, RAEs have been found among Canadian female national and international players (Weir, Smith, Paterson, & Horton, 2010), within intercollegiate ice hockey (Chittle, Horton, & Dixon, 2015; Geithner, Molenaar, Henriksson, Fjellman-Wiklund, & Gilenstam, 2018), and within elite and junior elite Swedish women's ice hockey players (Stenling & Holmström, 2014). Regardless of the competitive level, the RAE pattern is often atypical, characterized by an overrepresentation of athletes born in quartile two¹³ (e.g., Hancock, 2017; Chittle et al., 2015; Weir et al., 2010).

RAE and Positive Youth Development in Sport

Positive youth development is a concept that describes “strength-based and asset-building approaches to developmental research in which youth are viewed as ‘resources to be developed’ rather than ‘problems to be solved’” (Holt, Sehn, Spence, Newton, &

¹³ Typically, RAEs appear as a linear negative relationship between birth quartile and participation rates. Within female sports, the RAE pattern is often atypical, characterized by more athletes born in quartile two than any other quartile (e.g., Hancock, 2017).

Ball, 2012, p. 98). There have been a number of conceptualizations and frameworks proposed in the literature to measure PYD (e.g., Lerner's 'Five Cs' model, Larson's domains of learning or 'growth experiences'). Holt et al. (2017) conducted a meta-method analysis that led to the development of a model of PYD for sport. Their model consists of three categories: PYD climate (adult relationships, peer relationships, and parent involvement), life skills program focus (life skill building activities and transfer activities), and PYD outcomes (personal, social, and physical domains), while distinguishing between implicit and explicit processes that may facilitate PYD outcomes. This model also recognizes that characteristics of individuals (e.g., socio-demographic factors, traits, and dispositions) may influence athletes' attainment of PYD outcomes.

In order to advance this line of inquiry, there have been attempts to move beyond the study of participation rates and explore how the RAE may influence PYD outcomes. Within female and male ice hockey, studies have found that the frequency with which athletes demonstrate leadership does not differ as a result of relative age (Chittle et al., 2017a; Chittle, Horton, & Dixon, in-press). Similarly, researchers have examined if relative age influences developmental or 'growth experiences,' which are "experiences that teach you something or expand you in some way, that give you new skills, new attitudes, or new ways of interacting with others" (Dworkin, Larson, & Hansen, 2003, p. 20). The results of these studies suggested that positive and negative developmental experiences (as measured by the Youth Experience Survey-Sport (YES-S; MacDonald, Côté, Eys, & Deakin, 2012)) do not differ across relative age in female and male ice hockey (Chittle, Horton, Weir, & Dixon, 2017b; Chittle et al., 2019) or when multiple sports are analyzed together (Wattie et al., 2018). Similar findings are noted by Hancock

(2016) who found no differences in coach-rated competence, peer-rated competence, sport confidence, connection to coach, and character across the relative ages of female soccer players. Collectively, these studies suggest that relative age may not be a limiting factor in athletes acquiring PYD outcomes. However, Smith and Weir (2018) found that relatively younger soccer players reported higher commitment to learning and positive values than their relatively older peers, suggesting that more information is needed to understand the factors that may influence an athlete's ability to experience PYD. This is particularly important considering the paradoxical trends of relatively younger athletes being more sought-after (Wattie, MacDonald, & Cobley, 2015). One potential explanation for this RAE reversal is relatively younger athletes developing superior psychological skills (e.g., resiliency) as a result of overcoming the fact that they were less physically developed (e.g., Fumarco, Gibbs, Jarvis, & Rossi, 2017).

While there are initial selection biases associated with relative age (e.g., Cobley et al., 2009; Smith et al., 2018), evidence suggests that relative age may not disadvantage youth in terms of their PYD (e.g., Chittle et al., 2017a, 2017b; Wattie et al., 2018). However, what remains unknown is what mechanisms are supporting athletes in their development of these outcomes given that past research had suggested different experiences and assets between relatively older and younger athletes (Edwards & O'Donoghue, 2014; Smith & Weir, 2018). Furthermore, Holt et al. (2017) recognized that socio-demographic variables may impact the *ways* in which athletes acquire PYD. As such, the purpose of this study was to interview competitive female ice hockey players to gain an understanding of what mechanisms may facilitate (or hinder) their acquisition of PYD outcomes and whether these differ by relative age. A secondary aim

included exploring how athletes are applying these outcomes to other aspects of their lives. Identifying factors that contribute to PYD will be useful to sport administrators who are responsible for designing programs to ensure all athletes can reap the potential benefits associated with sport.

Methodology

Theoretical Approach

This research was grounded in ontological relativism (i.e., social reality is humanly constructed, multiple, and subjective) and constructionist epistemology (i.e., knowledge is subjectively created; Smith & Caddick, 2012) and was informed by Heidegger's (1962) interpretive phenomenological approach. This research was not a purely dedicated phenomenological study, instead it has phenomenological overtones. The use of overtones is appropriate given that qualitative research "is produced not from any 'pure' use of a method, but from the use of methods that are variously textured, toned, and hued" (Sandelowski, 2000, p. 337).

Phenomenologists target the subjective description of everyday experiences from the perspective of those living them (Crotty, 1998). Phenomenological approaches allow for the exploration of how human beings perceive, make sense of, and feel about their experiences (Patton, 2002). As a result, the aim of this research is to explore the developmental experiences of female ice hockey players in order to gain insights into their perceptions of what factors may have contributed to or hindered their attainment of PYD outcomes. There are two major approaches that guide most phenomenological studies, those informed by Husserl's descriptive phenomenology and those of

Heidegger's interpretive (hermeneutic) phenomenology (e.g., McConnel-Henry, Chapman, & Francis, 2009; Wojnar & Swanson, 2007). This particular study was informed by Heidegger's approach, which focuses on understanding the phenomena in context and recognizes that participants and the researcher have preunderstandings (i.e., forestructures of understanding¹⁴; Heidegger, 1962) shaped by their backgrounds and through interaction and interpretation they cogenerate an understanding of the phenomenon under study (Wojnar & Swanson, 2007). As a result, Heidegger rejects the notion of bracketing (e.g., McConnell et al., 2009; Pascal, 2010), suggesting instead that reflection allows individuals to become aware of their assumptions (Pascal, 2010). Interpretive phenomenology identifies that individuals' 'truths' about experiences may differ based upon perception. In selecting this methodological approach, it permits the understanding of the unique experiences relatively younger and older female ice hockey players may have and that these perceptions of experiences will differ across individuals. This is particularly important in relative age research as there are a number of factors and constraints that could influence athletes' experiences (Wattie, Schorer, et al., 2015).

Participants

The sample consisted of 10 relatively older athletes ($m_{\text{age}} = 17.2$ years) who were born in quartile two (i.e., born April ($n = 1$), May ($n = 4$), and June ($n = 5$)) and 10 relatively younger athletes ($m_{\text{age}} = 16.6$ years) born in quartile four (i.e., born October ($n = 6$), November ($n = 1$), December ($n = 3$)) based upon Hockey Canada's (2018) cut-off

¹⁴ The term forestructure of understanding consists of multiple components: "...fore-having (all individuals come to a situation with practical familiarity or background practices from their own world that make interpretation possible); fore-sight (the sociocultural background gives a point of view from which to make an interpretation); fore-conception (sociocultural background provides a basis for anticipation of what might be found in an investigation; Benner, 1994)" (as cited in Wojnar & Swanson, 2007, p. 174).

date of December 31st (athletes' ages ranged from 15 to 18 years). Within female ice hockey, quartile two and quartile four are often the most over- and under-represented, respectively (e.g., Hancock, 2017); therefore, we selected these quartiles in order to maximize our understanding of similarities and differences in their experiences.

Participants were born and competed within Canada, as other countries may use different ice hockey cut-off dates and have different sport developmental systems which may confound the influence of relative age. Please see Table 5 for participant demographics.

Data Collection

Purposeful criterion sampling (Patton, 2002; Sparkes & Smith 2014) was employed to recruit relatively older and younger youth female ice hockey players who had competed in competitive (i.e., rep/travel) ice hockey within the last 12 months from the date of their interview. This method of sampling led to the selection of 'information rich' participants who could provide in-depth insights about the research questions (Patton, 2002; Smith & Caddick, 2012). Creswell (2014) suggested a sample size of three to ten participants for phenomenological research; therefore, recruiting ten relatively older and ten relatively younger participants was our goal. Recruitment continued until data saturation was met (Patton, 2002).

A multifaceted recruitment approach was used to gather participants. Potential participants were targeted and contacted from a previous research study that surveyed competitive female ice hockey players. Within this survey, participants consented that they would be willing to participate in future studies and provided their personal contact information. Secondly, coaches forwarded information about the research study to their

players and granted permission to attend practices and/or games in order to invite athletes to participate in the study. Lastly, a recruitment flyer was posted on social media sites in order to expand recruitment efforts. This project was cleared by the authors' institutional Research Ethics Board.

Procedure

The lead investigator conducted individual semi-structured interviews that consisted primarily of open-ended questions and non-directive probes that allowed the interviewer the flexibility to seek additional detail from participants and explore new topics as they emerged (Patton, 2002). The research team developed a semi-structured interview guide that was informed by PYD and leadership literatures (Hansen & Larson, 2002, 2005; Holt et al., 2017; MacDonald et al., 2012) in order to examine what factors contributed to athletes experiencing PYD. Despite the influence of the aforementioned literature, interview questions were designed to be open-ended, allowing participants to respond based upon their own experiences. The interview was facilitated so that rapport could be built with participants and questions were piloted with two former female ice hockey players to ensure clarity and appropriate language.

The first series of questions were intended to gain background information about the participant (e.g., what is your date of birth?) and ease them into the interview to ensure they were comfortable. Through probing questions, the lead researcher encouraged participants to elaborate on their experiences in order to explore ideas in more depth. Interview questions encompassed several key themes in order to address the research questions: a) what PYD outcomes have athletes gained as a result of playing ice

hockey; b) how are these outcomes used outside of ice hockey, and; c) what mechanisms/factors led to athletes acquiring these PYD outcomes.

Following the completion of six interviews, a modification was made to the interview guide to include an activity where participants would rate the extent to which they believed ice hockey helped them develop a variety of PYD outcomes. These outcomes were informed by previous interviews and PYD literature (e.g., Côté & Fraser-Thomas, 2011; Holt et al., 2017). Prior to completing this activity, participants were asked what type of skills they developed in ice hockey, which allowed them to reflect on their experiences and respond without influence. This activity provided an additional opportunity for participants to reflect on their experiences and served as an additional probe. Eighteen of the 20 interviews were conducted face-to-face at a location of participants' choosing and ranged from 35.04 to 91.21 minutes in length ($m = 55.53$ minutes). Due to the geographical location of two participants, one interview was conducted over the telephone and one interview occurred over Skype. When possible, non-verbal cues such as body language (e.g., lack of eye contact) were noted so the researcher could be mindful of how probing questions made participants' feel to avoid making them unnecessarily uncomfortable. Following the completion of each interview, the lead researcher completed entries into a reflexive journal. The contents of the reflexive journal included: the lead researcher's position, assumptions, and biases when beginning the research, new areas to probe for additional information in subsequent interviews, stories shared by participants that mirrored the lead researcher's own sport experiences, potential themes, and ways in which the lead researcher could improve her interviewing techniques.

All interviews were audio-recorded and transcribed verbatim using Temi, a speech to text transcription software (Temi, 2019), resulting in approximately 278 pages of single-spaced text (215,948 words). To ensure accuracy and gain familiarity with the data, the lead researcher reviewed the written transcript and audio recording simultaneously and made corrections to the written transcript as required. All participants were assigned pseudonyms for the purpose of data presentation and to protect their confidentiality. For the purposes of data presentation, participants 1-10 were ‘relatively older’ and participants 11-20 were ‘relatively younger’.

Data Analysis

Given the theoretical groundings of this study, our findings are a joint construction between the interviewee and interviewer (Smith & Caddick, 2012). The lead researcher had an active role in cogenerating the research findings within this study. This was initiated in the development of the interview questions, throughout the interview process by deciding when and/or what to probe for additional information, and through data analysis by interpreting codes and creating meaningful themes from participants’ responses. Braun and Clarke’s (2006) six phases of thematic analysis were used to analyze the data: 1) familiarization with the data; 2) generating initial codes; 3) searching for themes; 4) reviewing themes; 5) defining and naming themes, and; 6) producing the report. This approach was selected as it permits theoretical freedom, flexibility, and allows similarities and differences across the dataset to be highlighted.

Interview data were organized into two groups, reflecting those collected from relatively older and relatively younger participants. These groups of data were first

analyzed independently and were then compared against one another to determine where similarities and differences existed in the PYD outcomes acquired and the contributing mechanisms. Data were analyzed using both inductive (i.e., what is in the data) and deductive (i.e., pre-established concepts that are used to code and interpret the data) coding given that interpretative phenomenology relies on researchers' forestructures of understanding. Deductive coding was informed by Holt et al.'s (2017) model of PYD in sport as well as instruments used to measure youth developmental experiences (Hansen & Larson, 2005; MacDonald et al., 2013). Thematic analysis permits the use of both inductive and deductive coding, recognizing that researchers are often informed by previous theory (Braun & Clarke, 2006; Patton, 2002). Once a satisfactory thematic map was created, themes were defined and redefined to determine the 'essence' or 'story' of each theme and how it fit into the broader findings of our participants' experiences. After analyzing the data for both groups, there were consistent themes present among the relatively older and younger participants and no clear differences were interpreted between them. As such, data extracts (i.e., quotes) from both relatively older and younger participants are presented under each theme to capture the essence of participants' experiences and interpretations (Braun & Clarke, 2006).

Rigour

Aligning with our epistemology and ontology, we used a relativist approach to select criteria that can be used to evaluate the rigour of our study (Sparkes & Smith, 2009). Adopting a relativist approach means permitting the researcher(s) to select criteria that are compatible with their philosophical assumptions (Smith & McGannon, 2018; Sparkes & Smith, 2009). As such, we selected specific criteria that can be used to

evaluate the quality of our research. We believe this research addresses a *worthy topic* and provides a *significant contribution* given the lack of qualitative methodologies used within the RAE literature and the scant attention given to how relative age influences PYD outcomes. *Rich rigour* was accomplished by interviewing both relatively older and younger athletes to ensure varied perspectives were captured, spending sufficient time interviewing participants, and continuing data collection and analysis until data saturation was met (Patton, 2002). *Sincerity* was demonstrated by providing transparency in the methods that were used and maintaining a reflexive journal that documented the lead researcher's values, biases, and inclinations that may influence the analysis and interpretation of the results. *Credibility* was accomplished by providing a 'thick description' of study results and including multiple and varied voices demonstrating multivocality (Tracy, 2010). Lastly, *coherence* was achieved by relying on methods that align with the philosophical underpinnings of the research (Tracy, 2010).

Results

At the outset of the interviews, the lead researcher anticipated potential differences in PYD outcomes across relatively younger and older athletes. This was informed by prior research which suggested that relatively younger athletes may have superior psychosocial skill sets from experiencing 'useful challenges' throughout the sport development period (Andronikos et al., 2016). Given the prior reports of varying sport experiences among relatively older and younger athletes (viz., Edwards & O'Donoghue, 2014) and the important role that social agents (e.g., coaches and parents) have in the perpetuation of the RAE and development of PYD, it was also anticipated that

different mechanisms may be needed to foster PYD outcomes among relatively younger and older athletes.

Our interviews illustrated that relatively younger and older female ice hockey players developed a similar range of PYD outcomes, including those in the personal (e.g., confidence, respect, goal setting, etc.), social (e.g., communication, leadership, etc.), and physical domains (e.g., movement skills, healthy active living). Both relatively younger and older athletes were applying these life skills to a variety of contexts (e.g., school, work, interpersonal relationships) outside of ice hockey. Given that these research questions were of secondary importance to the current study, data excerpts supporting these findings can be found in Tables 6 and 7.

Three interrelated themes were interpreted from our data analysis: *the social features of the sport environment, the structure of female travel/rep ice hockey, and negative ice hockey experiences*. These themes served as the overarching mechanisms that facilitated or hindered athletes' development of PYD outcomes. Within each of these themes are several sub-themes that are discussed. While unexpected, major themes and sub-themes were consistent across both relatively younger and older female ice hockey players.

Social Features of the Sport Environment

Both relatively younger and older athletes described key social relationships with coaches, parents, and their peers that contributed to their developmental experiences and were interpreted as sub-themes. Specifically, these relationships contributed to a climate that facilitated PYD outcomes by promoting life skills activities, providing opportunities

for athletes to develop personally and interpersonally, and reinforcing and modelling desirable behaviour.

Coaches played active roles in facilitating opportunities for positive developmental experiences. This was often achieved by providing opportunities for players to have growth experiences where they could develop tangible life skills. Participant 6 described how her coaches contributed to her leadership development by providing her with extensive responsibilities beyond what is typically expected of a player:

I learned how to motivate others and how to communicate more efficiently with the coaches because I was given that responsibility [of] planning tournaments. So, I'd have to go out of my way and talk to hotel managers, restaurant managers and that's made me a lot more aware of my leadership.

Moreover, coaches appeared to be responsible for establishing team culture, expectations, and creating a sporting environment that encouraged pro-social behaviours. Participant 8 explained that her coach would take away players' cell phones at team social events to foster team bonding and connections between players that would hopefully translate to on-ice chemistry. Similarly, Participant 15 stated that her coach emphasized the importance of players working collectively for the benefit of one another: "my coach talks a lot about how it's 17 of us so it's not just you in the room, it's everyone around you. So, you play for them and you work hard for them." Beyond setting these expectations, coaches also have the ability to reinforce positive and condemn the negative behaviours of athletes through controlling their playing time. For example, Participant 3

noted that if athletes do not learn to respect their coaches “they can easily just bench you.”

Participants also spoke of a culture of shared leadership on their teams. Regardless of an athlete’s status, coaches expected “everyone [to] be leading the group. Everyone should be their own leader” (Participant 1). The importance placed on shared leadership allowed players to feel as though “anyone in the dressing room [could] be a leader” (Participant 19), even if they were not designated as a captain or alternate captain. The emphasis placed on shared leadership allowed athletes to develop a range of leadership functions (e.g., task, social, motivation) that they could use outside of ice hockey. As such, athletes’ development of PYD outcomes were at least partly attributed to the teaching strategies and activities structured by their coaches.

Participants also expressed that their *parents* played active roles in reinforcing and modelling positive behaviours. For example, Participant 19 explained that her parents instilled the importance of respecting others, in part, because her father was a coach, so she witnessed the time demands associated with this role. Having this perspective encouraged an attitude of hard work and accountability: “to show my respect, I am always here at hockey... I don’t feel that me being too tired to come to practice is an excuse...when [coaches are] donating all this time” (Participant 19). Similarly, Participant 8 spoke of how her mom reinforced team expectations that contributed to her commitment to her team:

My mom always taught me you committed from the start so you’re going to finish. There would be one night where I’d be like, ‘Oh, I don’t want to go to

practice. I don't want to do this 'cause I don't want to go out' and she'd be like, 'What? You committed at the start, so you're not quitting.'

Overall, we found that athletes' parents had an important role in supporting their positive development and learning of pro-social behaviours that they use within and outside of sport.

Both relatively younger and older groups emphasized strong relationships with *peers* as important to their positive developmental experiences. Participants described the environment of ice hockey to be family-like, more so than other sports: "I also played soccer and didn't really feel such [a] family bond as much as hockey" (Participant 20). The dressing room atmosphere was important to creating the close-knit environment within hockey. Participant 3 explained that the time spent in the dressing room provided an opportunity for team bonding (e.g., 'goofing around,' creating memories) that may not exist in other sports: "the team environment of hockey, it's just so close knit.... [in] soccer there's not really that dressing room atmosphere." The strong peer relationships described by participants offered athletes a sense of belonging, which allowed them to feel comfortable with themselves. The friendships formed at hockey supported Participant 20 in her transition from being shy to more outgoing as she progressed in hockey: "I met my really good friends and they kind of brought me out of my shell. So, I guess [hockey] kind of made me more outgoing." Other participants attributed the family-like environment of ice hockey to their development of interpersonal skills:

I think it's the community, so for those interpersonal skills, 100% the community. You're with each other six, seven times a week so you have to learn

how to be with other people...and that's something that's unique to hockey because...other sports, you can do a lot of individual training and if you do something wrong, the onus is just on you. But with hockey, it's like you're training constantly and if you do something wrong, you're letting your team down. (Participant 6)

Strong peer relationships facilitated a PYD climate that was conducive to personal growth. Collectively, the social features of ice hockey (i.e., coaches, parents, and peers) had an integral role in fostering PYD among athletes. Often, the relationships between these social agents were a function of the structure and demands associated with travel/rep ice hockey.

Structure of Female Travel/Rep Hockey

The inherent structure of female ice hockey contributed to athletes' positive developmental experiences in multiple ways. Within this major theme were four sub-themes that permitted athletes' development of PYD outcomes: the intensity of the ice hockey schedule, roster turnover, ice hockey being a team sport, and underlying ice hockey values/expectations.

Firstly, the *intensity of the ice hockey schedule* requires a large time commitment by athletes due to the frequency with which teams practiced and the distances they traveled to compete in games and tournaments. Often, teams traveled considerable distances because there were a limited number of local teams against which they were able to compete. The time commitment associated with the intense ice hockey schedule required participants to develop strong time management skills in order to balance school

and ice hockey: “the hectic [hockey] schedule...it’s either you pick hockey or school or you time manage yourself and you can do both” (Participant 16). Coordinating these schedules became even more challenging when missing school for ice hockey games and tournaments, and practices were held later at night as players got older.

Secondly, *roster turnover* resulted in athletes competing with potentially different teammates from year to year. Participants discussed how these changes to team rosters each year provided an additional opportunity for personal and interpersonal development because of interacting with new teammates. Participant 12 felt that her leadership skills were enhanced by having to befriend new teammates after yearly roster changes. Participant 4 shared similar views and described how competing with different teammates every year helped her to develop respect for everyone, regardless of her personal feelings towards them:

Well [in] hockey...you’re with a lot of different people from whenever you started to when you end up, you’re going to meet a lot of people and you may not like them, but you have to respect them just like [in a] job one day. I might not like everyone I work with, but I have to respect them.

Consistently competing with new players allowed athletes to develop interpersonal skills.

Thirdly, *ice hockey is a team sport* that requires athletes to work together to accomplish their shared goals. As such, participants explained that ice hockey required them to develop teamwork and communicate effectively to ensure positive outcomes. For example, Participant 5 explained that “you have to work as a team...if you don’t work as a team then you’re not going to be successful in the game.” Likewise, Participant 11 saw

the teamwork required for a successful ice hockey team as developing social skills and the ability to cooperate with others.

Lastly, participants felt compelled to fulfill certain *underlying ice hockey values/expectations* seemingly inherent to the sport of ice hockey. Many of these expectations are rooted in the social value of sport or the positive outcomes that can be achieved through sport participation. For example, upon joining a team, there is the expectation that athletes commit to their team and consistently work hard. Participant 14 attributed the determination that she applies to other areas of her life to the constant need to push herself in ice hockey: “like finishing a game, you’re not going to quit halfway. You want to keep going, push right till the end, or even a shift, you won’t stop skating halfway to the puck.” Another value associated with ice hockey was trying one’s best, regardless of the outcome. For Participant 9, ice hockey taught her to accept that any outcome is okay “as long as you try your hardest, even if you don’t get the best mark or win.”

The competitive and physical nature of ice hockey results in the expectation that athletes deal with losing, injuries, and improve in the face of criticism. Athletes credited this aspect of ice hockey with developing their mental toughness. For Participant 16 this meant, “the more you get put down, the more you need to build your confidence. And, I think that has a lot to do with your mental toughness. Just being able to come back after someone tells you you’re not good enough and I think that has a lot to do with ice hockey because it happens all the time.” This mental toughness was one value that players identified as carrying over to other facets of their lives.

Within ice hockey there is also a fundamental expectation of respect for teammates, coaches, and opponents. For example, Participant 11 explained that respect is a key factor in ice hockey because:

You go on the boards and definitely grind it out with other girls. But at the end of the day, you always shake hands. I find that that is a really good part of hockey that I love. You always give respect to your other opponents whether you win or lose.

Athletes described how learning respect was important to their social interactions outside of the sport. The social environment of ice hockey as well as the programmatic and cultural aspects were identified as important factors to athletes' PYD; however, these features are not always positive and there were instances where these elements contributed to negative sporting experiences.

Negative Ice Hockey Experiences

While participants identified a number of mechanisms that contributed to their development of PYD outcomes, several factors limited their sport enjoyment and development. These sub-themes included difficult team dynamics, challenges with coaches (i.e., favouritism, poor behaviour, having a parent as a coach), and playing boys' ice hockey.

Difficult team dynamics were reported by both relatively young and older groups where participants described 'cliques' existing within teams that made them feel unwelcome. Participant 10 explained how she experienced bullying on a past team because she was shy and perceived the team as having cliques:

In the past, it was so cliquy, and I struggled with that. And, when I was in my first year, there was just a girl that didn't like me, and I didn't really know why and she kind of turned some of the other girls against me towards the end so, I struggled with that.

Other participants identified how cliques on their teams led to isolating experiences where they found it difficult to make friends and witnessed discord among players. The peer environment within ice hockey often varied across teams such that peer-to-peer relationships facilitated PYD in some cases, but negatively impacted athletes' experiences in other instances.

Similarly, other relationships within ice hockey, such as those with coaches, were not always positive either. Many participants experienced *challenges with coaches*, stemming from them favouring certain athletes for personal reasons, unrelated to their performance. Participants perceived that parent-coaches were more inclined to select their children during tryouts and provided them with more ice time. Multiple participants reinforced the idea of "friends of friends [getting] picked for teams" (Participant 9). Beyond this participation bias, athletes reported cases of coaches demonstrating poor behaviours, including swearing, throwing objects, and/or punishing players for unsatisfactory performances. In one instance, a coach threw all his players' provincial bronze medals in the trash and said, "it's not gold, it's not worthy" (Participant 11). These types of interactions with coaches negatively affected athletes' experiences and, for some, made them want to quit the sport or play at lower competitive levels.

Some relatively younger and older participants discussed the difficulty of having their parents as their coach. One relatively younger participant described the additional pressure she felt having her dad as a coach. In her view, coach-parents are harder on their own children than the rest of the team. However, she noted certain motivational benefits of playing for her father. Specifically, she commented that when her dad was not her coach, she felt less pressure “but also [didn’t] feel the pressure to be better” (Participant 19). Beyond this added pressure, the coach/parent-athlete/child dynamic tended to cause undue strain on their personal relationships. This was exemplified by Participant 16 who threatened to quit ice hockey if her dad kept coaching:

I think that it took a hit on our relationship because I was seeing him on the ice, on the bench, at home, in the car. So, ... sometimes it was like, okay, stop, back up, like, we need space.

Similarly, Participant 10 expressed dislike for having her dad as a coach because of his criticism and inability to just watch her play. She described how ice hockey would consume all aspects of their interactions where her father would constantly want to talk about ice hockey but instead, she wanted him to “sit in the stands...relax and watch his kid play.” It is evident that coaches played an important role in these athletes’ ice hockey experiences and their choice of behaviours greatly facilitated or hindered their PYD.

Lastly, a small number of participants *played boys’ ice hockey* prior to competing in girls’ ice hockey. While this offered opportunities for athletes to be physically challenged (e.g., faster shots), at times the social environment compromised athletes’ abilities to experience PYD. Participant 17 noted that her male teammates would

intentionally try to discourage the female players. Beyond the conflicts between male-female teammates, the parents of male players often contributed to the negative sporting environment of female athletes. In particular, Participant 13 perceived the parents of male teammates as being hostile towards her because she was taking away ice time from their children. Similarly, Participant 4 explained that she was treated differently by her male teammates and their parents while competing in boys' ice hockey, which caused her to switch to girls' ice hockey earlier than she anticipated. She saw this as "the world we live in right now," where people "don't want girls playing a boy's sport" (Participant 4). For her, this was motivation to work harder, to change parents' perceptions so they would see her as equal to her male teammates. Participant 7 perceived that her leadership opportunities were limited while playing boy's ice hockey because she had her own dressing room where she "wasn't really able to be a leader in the dressing room." Despite boys' ice hockey possibly offering a 'faster' game, which could enhance female players' skill level, reports from participants suggested that in some cases, the negative sport environment made them a target for criticism and limited their opportunities for PYD.

Discussion

To the best of our knowledge, only three RAE qualitative studies exist, with only two of these targeting athletes' perceptions (Edwards & O'Donoghue, 2014; Sherman & Hancock, 2016). As such, this study sought to qualitatively identify mechanisms that contribute to (or hinder) female ice hockey players' development of PYD outcomes to determine whether these factors differed among relatively older and younger athletes. A secondary purpose included identifying how athletes were applying these outcomes outside of ice hockey.

The idea that sport, if properly structured, has the capacity to facilitate positive outcomes is well established in the literature (e.g., Côté & Fraser-Thomas, 2011; Holt & Neely, 2011; Holt et al., 2017). Our research supports this finding by illustrating that relatively older and younger athletes were developing a plethora of life skills (see Table 6) that aligned with Holt et al.'s (2017) categories of PYD outcomes (i.e., personal, social, physical) due to their ice hockey participation and that they frequently used these skills within school, work, and personal interactions (see Table 7). Notable differences in PYD outcomes did not exist across relatively younger and older athletes. Across relatively older and younger participants, social features of the sport environment and the structure of female travel/rep ice hockey facilitated PYD outcomes in athletes, while negative ice hockey experiences limited these outcomes. Moreover, sub-themes did not illuminate differences in perspectives across relative younger and older players.

Sport is associated with both positive and negative outcomes (Côté & Fraser-Thomas, 2011; Holt & Neely 2011). Developmental benefits of sport are contingent on social contextual factors such as interactions with coaches, parents, and peers (Holt et al., 2017; Holt & Neely, 2011). Aligning with this notion, our participants stressed the key roles that their coaches, parents, and peers had on their development through cultivating a supportive environment, providing opportunities for life skill development, and reinforcing positive behaviours. These findings align with Holt et al.'s model (2017), which suggests that the PYD climate (i.e., social environment) facilitates opportunities that can result in PYD outcomes. Within our study, participants described the lead role coaches had in creating a team environment that encouraged shared leadership among players. In creating this culture, athletes felt compelled and comfortable demonstrating

leadership through speaking up in the dressing room, motivating teammates, and providing social support for peers. One participant described the active role she had in team planning and scheduling (e.g., selecting tournaments to compete in), which provided her an opportunity to develop life skills. Coaches also contributed by cultivating an environment that encouraged personal and interpersonal development that is required for ice hockey (e.g., teamwork, respect). This supports previous literature that suggests the coach-athlete relationship is an important component of athletes' acquisition of PYD outcomes (e.g., Flett, Gould, Griffes, & Lauer, 2013; Fraser-Thomas & Côté, 2009).

Parents have the ability to influence children's development through modelling positive behaviours, attitudes, and beliefs about sport participation (Fredricks & Eccles, 2004). Our research suggests parents contribute to athletes' personal and interpersonal development by teaching and reinforcing positive behaviours and personal responsibility (e.g., team commitment). This aligns with Holt et al.'s (2017) model and Neely and Holt (2014) who found parents played a critical role in children gaining the benefits of sport by reinforcing principles (e.g., personal responsibility, teamwork) and seizing 'teachable moments.'

Sense of community and strong peer relationships are important findings that were interpreted from the data, supporting previous research (e.g., Fraser-Thomas & Côté, 2009; Holt et al., 2017; Turnnidge, Vierimaa, & Côté, 2012). Participants described how the family-like environment of ice hockey allowed for them to be more confident and develop interpersonal skills. This sense of community likely contributed to athletes feeling comfortable engaging in athlete leadership. Many participants noted that leadership experiences in ice hockey prepared them be leaders in other capacities of their

life. Ice hockey requires athletes to gather in the dressing room before and after games and practices. This dedicated space seemed to encourage team bonding in a way that may not be present in other sports. Male coaches are not present in the dressing room while female players are (un)dressing, so this permitted additional team interaction that was independent of coaches, which may furnish opportunities for athlete leaders to emerge.

The second major theme that we interpreted as contributing to PYD was the structure of female ice hockey. Sub-themes highlighted programmatic, policy, and cultural aspects of ice hockey. Specifically, travel/rep female ice hockey requires athletes to spend a considerable amount of time training together. Due to the geographical diversity of teams, participants often reported traveling considerable distances to play games and these would often occur on weeknights. These demands forced athletes to learn time management skills in order to balance school, ice hockey, and other life responsibilities. Furthermore, the time spent traveling and the frequency with which athletes were together likely contributed to their team bonding and the community environment they experienced. Existing ice hockey policies dictate that travel/rep ice hockey teams are selected through a try-out process. Through this policy, athletes are required to interact with a variety of peers, which can build a sense of community. Lastly, it appears that embedded within the culture of ice hockey are expectations that are inherent to the sport and athletes often feel compelled to fulfill these expectations (e.g., respect). These mechanisms permitted the development of PYD outcomes that could be used in many contexts (e.g., school, work).

Research has only recently begun exploring the psychosocial impacts of the RAE on athletes (e.g., Chittle et al., 2017a, 2017b, Wattie et al., 2018). These studies

demonstrated that developmental experiences do not differ across birth quartiles within ice hockey or across multiple sports. Our study results support and expand on those findings in that we were able to identify specific factors that facilitated athletes' developmental experiences. Within the current study, athletes' responses suggested relative age disparities did not result in different PYD outcomes or change the way in which these outcomes were acquired. Unlike Edwards and O'Donoghue (2014), the relatively younger participants in our study did not report higher performance (e.g., negative experiences in training/matches) or social attrition motives (e.g., conflicts) than relatively older athletes. These inconsistencies may be attributed to the sport contexts where the studies occurred or the difference in the ages of study participants. Edwards and O'Donoghue's (2014) participants were considerably older (24-52 years of age) than the participants within the current study, which could impact athletes' perceptions of their experiences.

While sport programs can greatly contribute to youth's psychosocial development by providing opportunities to learn life skills, it can also be associated with negative outcomes such as decreased confidence/self-esteem and isolation from teammates (Côté & Fraser-Thomas, 2011). Our findings illustrate that two social factors within the PYD climate (i.e., coaches and peers) can also hinder the development of PYD outcomes. Consistent with past research (e.g., Fraser-Thomas & Côté, 2009), the participants in our study expressed challenges they faced with coaches, including favouritism and inappropriate behaviours being demonstrated by coaches. Favouritism often occurred when coaches selected players based on who their parents were or if they were their daughters' friends. This favouritism also influenced how coaches distributed playing time

and feedback among players. There were also instances of coaches swearing and behaving angrily towards athletes, which reduced their sport enjoyment. These findings illustrate that coaches' actions can be detrimental to athletes' acquisition of PYD outcomes.

A small number of athletes were currently and/or previously coached by one of their own parents. One participant discussed a dichotomy where having her dad as a coach caused additional pressure, but when not coached by him she felt less pressure to improve her performance. Other athletes described the considerable strain having their dad as a coach had on their relationship. This often stemmed from ice hockey being an overwhelming factor in their relationship and 'spilling-over' (Jowett, Timson-Katchis, & Adams, 2007) to the parent-child relationship. This finding is consistent with available literature that suggests the experience and relationships between parents/coaches - child/athletes can be negative (e.g., Elliott & Drummond, 2017; Jowett, 2008; Weiss & Fretwell, 2005). Participants also highlighted that negative peer interactions and cliques on teams often led to negative sporting experiences where they felt isolated and unable to make friends. This is concerning given that friends and peers are a primary factor in children's participation in sport (Bailey, Cope, & Pearce, 2013). Other negative experiences emerged when girls played boys' ice hockey. This included feeling discriminated against by athletes and/or parents and having fewer leadership opportunities as a result of being in a separate dressing room. While the current study only had a small number of participants who had played competitive boys' ice hockey, it raises the question if the developmental opportunities associated with girls playing boys'

ice hockey (e.g., increased physicality, faster game) outweigh the possible limitations to PYD outcomes.

Limitations and Future Directions

One of the limitations of this study is the potential for participants to have competed on the same ice hockey team(s). As such, there is likely to be some overlap in the mechanisms that they identified as contributing to PYD outcomes due to the similar ice hockey environment that they were participating in. There was also the possibility of ‘recency bias’ in that athletes may have more frequently drawn on their current rather than previous ice hockey experiences. There is also the potential that athletes’ perspectives of their developmental experiences may change over time, which was not captured in this study. Researchers may benefit from interviewing athletes who are no longer engaged in competitive ice hockey and may have time for additional reflection. This study relied on athletes’ perceptions of the PYD outcomes that they acquired from participating in ice hockey; however there is the possibility that these outcomes were also developed and/or refined elsewhere (e.g., in school or work).

Participants in this sample ranged from 15-18 years of age; therefore relative age is compounded with differences in absolute age across participants. These differences in absolute age may influence athletes’ perceptions of their experiences. Furthermore, our study did not focus on female ice hockey players who had previously dropped out, nor did it expand beyond 15-18-year-old female ice hockey players. Including athletes who have dropped out of sport would provide important insights into whether relative age played a role in their decision. Additionally, within the relatively older and younger

groups, there was not an equal proportion of athletes drawn from each month. For example, within quartile two, half of the participants were born in June ($n = 5$), while most athletes from quartile four were born in October ($n = 6$), which truncated relative age disparities and may have minimized the ability to discern differences in athletes' experiences. Additional research may benefit from comparing the experiences of athletes born in quartile one with those born in quartile four. Future studies that seek to understand the developmental experiences of former female ice hockey players would prove valuable in order to better comprehend if these experiences were factors in their cessation of ice hockey. Expanding this line of inquiry to male ice hockey and/or different age categories would elucidate if factors that contribute to PYD outcomes differ by sex or age, helping to contextualize the influence of RAE on PYD. Lastly, additional qualitative studies are needed to better understand how environmental, task, and individual constraints associated with RAEs may influence PYD outcomes in athletes.

This research contributes to the RAE literature by giving voice to female ice hockey players and highlighting possible mechanisms that contributed to PYD outcomes and identified factors that may have hindered these. This study addresses a considerable gap in the RAE literature by: a) moving beyond testing for the presence of the RAE and instead, exploring the impact of RAEs on PYD; and b) employing a qualitative research design, which has been lacking in the RAE literature. Prior research suggested that youth developmental experiences and leadership did not vary by quartile of birth (e.g., Chittle et al., 2019, in-press); however, the factors that were perpetuating these positive experiences for both relatively younger and older athletes were unclear. Most PYD literature has not considered the relative ages of athletes and, therefore, this study

provides initial evidence of possible mechanisms that facilitate PYD in female ice hockey, while simultaneously examining whether differences existed between athletes of varying relative age. In utilizing this qualitative approach, we have a better understanding of the rich experiences female athletes are having in ice hockey, which can be used to inform current and future theoretical models of the RAE. Sport stakeholders may benefit from the first-hand accounts of sport experiences gathered through this study to inform the creation of sport environments that facilitate relatively younger and older athletes acquiring PYD outcomes.

REFERENCES

- Andronikos, G. Elumaro, A. I., Westbury, T., & Martindale, R. J. J. (2016). Relative age effect: Implications for effective practice. *Journal of Sports Sciences, 34*, 1124-1131.
- Bailey, R., Cope, E. J., & Pearce, G. (2013). Why do children take part in, and remain involved in sport? *International Journal of Coaching Science, 7*(1), 56-75.
- Baker, J., Schorer, J., & Cobley, S. (2010). Relative age effects: An inevitable consequence of elite sport? *Sportwissenschaft, 40*(1), 26-30.
- Barnsley, R. H., Thompson, A. H., & Barnsley, P. E. (1985). Hockey success and birthdate: The RAE. *Canadian Association for Health, Physical Education, and Recreation, 51*, 23-28.
- Barrow, H. M., & McGee, R. (1971). *A practical approach to measurement in physical education*. Philadelphia, PA: Lea & Febiger.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.
- Chittle, L., Dixon, J. C., & Horton, S. (2019). Youth developmental experiences among female hockey players: The role of relative age. *Journal of Youth Development, 14*(4), 83-100.

- Chittle, L., Horton, S., & Dixon, J. C. (in press). Examining the role of relative age on leadership behaviors among female ice hockey players: An exploratory investigation. *Journal of Amateur Sport*.
- Chittle, L., Horton, S., Weir, P., & Dixon, J. C. (2017a). Investigating the relationship between the relative age effect and leadership behaviors among male ice hockey players. *International Review for the Sociology of Sport*, 52(6), 751-768.
- Chittle, L., Horton, S., Weir, P., & Dixon, J. C. (2017b). Exploring the relationship between relative age effect and youth development among male recreational ice hockey players. *Journal of Amateur Sport*, 3(1), 79-95.
- Chittle, L., Horton, S., & Dixon, J. C. (2015). Exploring the relative age effect in Canadian interuniversity ice hockey. *Talent Development & Excellence*, 7(1), 69-81.
- Cobley, S., Baker, J., Wattie, N., & McKenna, J. M. (2009). Annual age-grouping and athlete development: A meta-analytic review of relative age effects in sport. *Sports Medicine*, 39(3), 235-256.
- Côté, J., & Fraser-Thomas, J. (2011). Youth involvement and positive development in sport. In P. R. E. Crocker (ed.). *Sport psychology: A Canadian perspective*, (2nd ed., pp. 226-255). Toronto, ON: Pearson Prentice Hall
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage.

- Crotty, M. (1998). *The foundations of social research: Meaning and perspectives in the research process*. London, UK: Sage.
- Delorme, N., Boiché, J., & Raspaud, M. (2010). Relative age effect in female sport: A diachronic examination of soccer players. *Scandinavian Journal of Medicine & Science in Sports, 20*, 509-515.
- Dworkin, J. B., Larson, R., & Hansen, D. (2003). Adolescents' accounts of growth experiences in youth activities. *Journal of Youth and Adolescence, 32*, 17-26.
- Edwards, L., & O'Donoghue, P. G. (2014). Relative age effect in netball: A qualitative investigation. *International Journal of Coaching Science, 8*(1), 47-68.
- Elliott, S., & Drummond, M. (2017). The experience of parent/coaches in youth sport: A qualitative exploration of junior Australian football. *Special Issue: Family Issues in Amateur Athletics, 3*(3), 64-85.
- Flett, M. R., Gould, D., Griffes, K. R., & Lauer, L. (2013). Tough love for underserved youth: A comparison of more and less effective coaching. *The Sport Psychologist, 27*, 325-337.
- Fraser-Thomas, J., & Côté, J. (2009). Understanding adolescents' positive and negative developmental experiences in sport. *The Sport Psychologist, 23*, 3-23.
- Fredricks, J. A., & Eccles, J. S. (2004). Parental influences on youth involvement in sports. In M. R. Weiss (Ed.), *Developmental sport and exercise psychology: A lifespan perspective* (pp. 145-164). Morgantown, WV: Fitness Information Technology.

- Geither, C. A., Molenaar, C. E., Henriksson, T., Fjellman-Wiklund, A., & Gilenstam, K. (2018). Relative age effects in women's ice hockey: Contributions of body size and maturity status. *Women in Sport and Physical Activity Journal*, 26, 124-133.
- Fumarco, L., Gibbs, B. G., Javis, J. A., & Rossi, G. (2017). The relative age effect reversal among National Hockey League elite. *PLoS ONE*, 12(8), e0182827.
- Hancock, D. J. (2016). Relative age effects and positive youth development. *Journal of Sport & Exercise Psychology*, 38, S199.
- Hancock, D. (2017). Female relative age effects and the second-quartile phenomenon in young female ice hockey players. *Psychology of Sport and Exercise*, 32, 12-16.
- Hancock, D. J., Adler, A. L., & Côté, J. (2013) A proposed theoretical model to explain relative age effects in sport. *European Journal of Sport Science*, 13(6), 630-637.
- Hancock, D. J., Seal, K., Young, B. W., Weir, P. L., & Ste-Marie, D. M. (2013). Examining mechanisms that contribute to relative age effects in pre-pubescent female ice hockey players. *Talent Development & Excellence*, 5, 59-66.
- Hansen, D. M., & Larson, R. (2002). The youth experience survey 1.0: Instrument development and testing. Unpublished manuscript, University of Illinois at Urbana-Champaign. Retrieved from <http://web.aces.uiuc.edu/youthdev/>.
- Hansen, D. M., & Larson, R. (2005). The youth experience survey 2.0: Instrument revisions and validity testing. Unpublished manuscript, University of Illinois at Urbana-Champaign. Retrieved from <http://web.aces.uiuc.edu/youthdev/>.

- Heidegger, M. (1962). *Being and time* (J. Macquarrie & E. Robinson, Trans.). New York, NY: Harper & Row.
- Helsen, W. F., Starkes, J. L., & Van Winckel, J. (1998). The influence of relative age on success and dropout in male soccer players. *American Journal of Human Biology*, *10*, 791-798.
- Hockey Canada. (2018). By-laws regulation history. Retrieved from <https://cdn.hockeycanada.ca/hockey-canada/Corporate/About/Downloads/2018-19-bylaws-e.pdf>
- Holt, N. L., & Neely, K. C. (2011). Positive youth development through sport: A review. *Revista de Iberoamericana de Psicología del Ejercicio y el Deporte (English version)*, *6*, 299-316.
- Holt, N. L., Neely, K. C., Slater, L. G., Camiré, M., Côté, J., Fraser-Thomas, J., . . . Tamminen, K. A. (2017). A grounded theory of positive youth development through sport based on results from a qualitative meta-study. *International Review of Sport and Exercise Psychology*, *10*(1), 1-49.
- Holt, N. L., Sehn, Z. L., Spence, J. C., Newton, A. S., & Ball, G. D. C., (2012). Physical education and sport programs at an inner city school: Exploring possibilities for positive youth development. *Physical Education and Sport Pedagogy*, *17*(1), 97-113.
- Jowett, S. (2008). Outgrowing the familial coach-athlete relationship. *International Journal of Sport Psychology*, *39*(1), 20-40.

- Jowett, S., Timson-Katchis, M., & Adams, R. (2007). Too close for comfort?
International Journal of Coaching Science, 1(1), 59-78.
- MacDonald, D.J., Côté, J., Eys, M. & Deakin, J. (2012) Psychometric properties of the Youth Experience Survey with young athletes. *Psychology of Sport and Exercise, 13*, 332-340.
- McConnell-Henry, T., Chapman, Y., & Francis, K. (2009). Husserl and Heidegger: Exploring the disparity. *International Journal of Nursing Practice, 15*, 7-15.
- Musch, J., & Grondin, S. (2001). Unequal competition as an impediment to personal development: A review of the relative age effect in sport. *Developmental Review, 21*, 147-167.
- Neely, K. C., & Holt, N. L. (2014). Parents' perspectives on the benefits of sport participation for young children. *The Sport Psychologist, 28*, 255-268.
- Pascal, J. (2010). Phenomenology as a research method for social work contexts: Understanding the lived experience of cancer survival. *Currents: Scholarship in Human Services, 9*, 1-23.
- Patton, M. Q. (2002). *Qualitative evaluation and research methods* (3rd ed.). Newbury Park, CA: Sage.
- Sandelowski, M. (2000). Focus on research methods: Whatever happened to qualitative description. *Research in Nursing & Health, 23*, 334-340.

- Sherman, A., & Hancock, D. J. (2016). Awareness and perceptions of relative age effects: A case study analysis. *Journal of Sport & Exercise Psychology, 38*, S255
- Smith, B., & Caddick, N. (2012). Qualitative methods in sport: A concise overview for guiding social scientific sport research. *Asia Pacific Journal of Sport and Social Science, 1*, 60- 73.
- Smith, B., & McGannon, K. R. (2018). Developing rigor in qualitative research: Problems and opportunities within sport and exercise psychology. *International Review of Sport and Exercise Psychology, 11*(1), 101-121.
- Smith, K. L., & Weir, P. L. (2018, October). Advantage reversals and relative age: Does positive youth development play a role? *Journal of Exercise, Movement, and Sport, 50*, 186. Retrieved from:
<https://www.scapps.org/jems/index.php/1/article/view/1892>
- Smith, K. L., & Weir, P. L. (2013). An examination of the relative age effect in developmental girls' hockey in Ontario. *High Ability Studies, 24*(2), 171-184.
- Smith, K. L., Weir, P. L., Till, K., Romann, M., & Cobley, S., (2018). Relative age effects within female sport contexts: A systematic review and meta-analysis. *Sports Medicine, 48*(6), 1451-1478.
- Sparkes, A. C., & Smith, B. (2014). *Qualitative research methods in sport, exercise and health: From process to product*. New York: Routledge.

- Sparkes, A. C., & Smith, B. (2009). Judging the quality of qualitative inquiry: Criteriology and relativism in action. *Psychology of Sport and Exercise, 10*, 491–497.
- Stenling, A., & Holmström, S. (2014). Evidence of relative age effects in Swedish women's ice hockey. *Talent Development & Excellence, 6*(1), 31-40.
- Temi. (2019). Speech to text transcription. Retrieved from <https://www.temi.com/>
- Tracy, S. J. (2010). Qualitative quality: Eight “big-tent” criteria for excellent qualitative research. *Qualitative Inquiry, 16*, 837-851.
- Turnnidge, J., Vierimaa, M., & Côté, J. (2012). An in-depth investigation of a model sport program for athletes with a physical disability. *Psychology, 3*, 1131-1141.
- Wattie, N., MacDonald, D. J., & Cobley, S. (2015). Birthdate and birthplace effects on expertise attainment. In J. Baker & D. Farrow (Eds.), *The Routledge handbook of sport expertise* (pp. 373-382). London, UK: Routledge.
- Wattie, N., Schorer, J., & Baker, J. (2015). The relative age effect in sport: A developmental systems model. *Sports Medicine, 45*(1), 83-94.
- Wattie, N., Sornberger, B., & Fraser-Thomas, J. (2018). The influence of relative age on youths' developmental experiences in sport. *Journal of Exercise, Movement, and Sport, 50*, 200. Retrieved from: <https://www.scapps.org/jems/index.php/1/article/view/1906>

- Weir, P. L., Smith, K. L., Paterson, C., & Horton, S. (2010). Canadian women's ice hockey - evidence of a relative age effect. *Talent Development & Excellence*, 2(2), 209-217.
- Weiss, M. R., & Fretwell, S. D. (2005). The parent-coach/child-athlete relationship in youth sport: Cordial, contentious or conundrum? *Research Quarterly for Exercise and Sport*, 76(3), 286-305.
- Wojnar, D. M., & Swanson, K. M. (2007). Phenomenology: An exploration. *Journal of Holistic Nursing*, 25(3), 172-180.

CHAPTER 5

DISCUSSION AND CONCLUSION

When carefully organized, sport has the potential to teach youth physical health, along with fostering psychosocial development (e.g., leadership, co-operation) and motor skills (Côté & Fraser-Thomas, 2011). However, relying on chronological age to group athletes may compromise youths' opportunities to engage in sport. There is consistent evidence that relative age effects (RAEs) are present in a multitude of sports, and at a range of competitive levels (Cobley, Baker, Wattie, & McKenna, 2009; Smith, Weir, Till, Romann, & Cobley, 2018). The frequency with which researchers have seen RAEs in sport suggests that participation inequalities are vast, and in part, a consequence of arbitrary cut-off dates employed by sport organizations. While pervasive and persistent, RAEs are complex, with broad and subtle effects based upon the context with which they are studied (Baker, Chittle, Horton, & Dixon, 2020). Despite this area of study becoming more theoretically grounded (e.g., Wattie, Schorer, & Baker, 2015), much of the RAE research has focused on the participatory (dis)advantages associated with relative age (e.g., Cobley et al., 2009) and how various factors (i.e., individual, task, and environmental constraints) may influence RAE patterns (e.g., Hancock, Ste-Marie, & Young, 2013; Sherar, Baxter-Jones, Faulkner, & Russel, 2007). Despite the plethora of research examining RAEs in sport, the majority of these studies have failed to consider the implications that relative age disparities may have on positive youth development (PYD). This is concerning given that parents often enroll their children in sport because they value the possible benefits associated with it (Neely & Holt, 2014). Of the small number of studies that have examined PYD, most have focused on male sport (e.g.,

Chittle, Horton, Weir, & Dixon, 2017a; Chittle, Horton, Weir, & Dixon, 2017b) or analyzed multiple sports collectively (Wattie, Sornberger, & Fraser-Thomas, 2018). Thus, the objective of this dissertation was to explore differences in PYD across the relative ages of female ice hockey players, as well as to determine if the mechanisms that contribute to athletes' acquisition of PYD differed by relative age.

Chapter 2 includes an exploration of the impact of relative age on leadership behaviours (as measured by the Leadership Scale for Sport; Chelladurai & Saleh, 1980) among competitive female ice hockey players (ages 15-18 years), thereby addressing a gap in the RAE literature. Secondary purposes included testing for the existence of a RAE and examining if leadership behaviours differed between captains and non-captains. The results illustrated that the frequency with which female ice hockey players demonstrate leadership did not differ by relative age, supporting the findings previously observed in male ice hockey (Chittle et al., 2017a). Preliminary evidence exists that relatively older athletes may be more likely to be selected as formal leaders within female ice hockey. However, this does not appear to influence athletes' abilities to be leaders within their teams as both relatively younger and older athletes perceive themselves as frequently demonstrating various leadership behaviours. This finding highlights the importance of fostering informal leadership opportunities and creating expectations for shared leadership as a means to build leadership capacity. A RAE trend was present among this sample of female ice hockey players; however, the chi-square goodness of fit tests did not reach statistical significance. Formal leaders (i.e., captains and alternate captains) reported higher frequencies of training and instruction, positive feedback, democratic behaviour, and social support than non-captains. Overall, the findings from

chapter two suggest that all female ice hockey players, regardless of their relative age, perceive themselves as demonstrating similar quantities of leadership behaviours. As such, female ice hockey may be a useful avenue to facilitate leadership development or, at the very least, is providing equitable opportunities for athletes to engage in leadership.

The aim of Chapter 3 was to determine if developmental experiences among female ice hockey players (ages 15-18) differed by relative age. Participants completed the Youth Experience Survey for Sport in order to measure positive (i.e., personal and social skills, cognitive skills, goal setting, and initiative) and negative developmental outcomes (MacDonald, Côté, Eys, & Deakin, 2012). Similar to Chapter 2, there was a RAE trend, whereby more players were born in the first half of the year compared to the latter half. The MANOVA findings demonstrated that developmental experiences did not differ by birth quartile. These results suggest that, regardless of relative age, female ice hockey players who maintained their involvement in travel/rep hockey experienced positive developmental outcomes. This finding stresses the importance for sport administrators to develop sport contexts that provide equitable opportunities for athletes to engage in travel/rep hockey throughout the development period. Accomplishing this task requires athletes to overcome the participatory (dis)advantages that are often present in female ice hockey.

Chapter 4 consists of an examination of the mechanisms that contributed to (or hindered) relatively younger and older athletes' acquisition of PYD outcomes in female ice hockey. Secondary objectives included determining if PYD outcomes varied by relative age as well as how athletes employed these skills in other contexts. Ten relatively older and ten relatively younger female ice hockey players participated in semi-structured

interviews. Participants responded that they developed a range of PYD outcomes, including those related to personal, social, and physical skills. They often applied these skills within school, volunteering/extracurricular activities, work, and relationships.

The data analysis revealed three interrelated themes that facilitated and/or hindered athletes acquiring these PYD outcomes: the social features of the sport environment, the structure of female travel/rep ice hockey, and negative ice hockey experiences. Across relatively younger and older athletes, there did not appear to be any differences in PYD outcomes or the mechanisms that facilitated these outcomes. Coaches, parents, and peers were identified as key social agents that contributed to a climate that perpetuated PYD outcomes. This was achieved by coaches and parents reinforcing and modelling appropriate behaviours, as well as providing opportunities for athletes to develop personally and interpersonally. Participants described the importance of their peers and the ‘family-like’ environment within female ice hockey which contributed to their positive development. This environment allowed them to be comfortable with themselves, as well as demonstrate leadership and other social behaviours. Thus, relationships with coaches, parents, and peers enabled experiences that contributed to PYD outcomes. The structure of travel/rep female ice hockey, characterized as a team sport with an intense practice and play schedule, and yearly roster turnover, forced athletes to develop social skills (e.g., teamwork, interpersonal skills) as well as carefully manage their time. The underlying hockey values/expectations also contributed to athletes acquiring PYD outcomes such as mental toughness and commitment. Athletes also identified that difficult team dynamics (e.g., cliques),

challenges with coaches, and competing on boys' ice hockey teams as factors that limited their PYD.

Given that most RAE research has been cross-sectional and quantitative, this study addressed a considerable gap in the literature by providing an outlet for athletes to express their perceptions of their experiences in sport, which may help inform future theoretical models of the RAE. The first-hand accounts of sport experiences gathered through this study can be used by sport stakeholders to inform the creation of sport environments that facilitate relatively younger and older athletes experiencing PYD.

Future Research Directions

Cobley et al. (2009) argued for more theoretical understandings of: 1) the origins of the RAE; 2) the implications of the RAE for human development, and; 3) solutions to modify or remove the RAE. Since this time, researchers have attempted to address these under-studied areas, which has resulted in the creation of two RAE frameworks (Hancock, Adler, & Côté, 2013; Wattie et al., 2015). A limitation of these frameworks is that they do not account for the range of consequences that may, in part, be influenced by relative age disparities (e.g., drop out, psychosocial development). In some cases, these outcomes may mutually interact with the RAE. In particular, PYD could be one outcome affected by relative age. In fact, the relationship between the RAE and PYD may be reciprocal, where certain PYD outcomes (e.g., resiliency, motivation) might be important individual (functional) constraints that can alter the RAE profile. For example, when relatively younger athletes become more sought-after and successful (i.e., 'RAE reversals'), this has been attributed to superior psychosocial skillsets (e.g., Andronikos et

al., 2016; Fumarco, Gibbs, Jarvis, & Rossi, 2017; McCarthy & Collins, 2014). These psychological characteristics are critical for elite sport (Andronikos et al., 2016) and could explain how relatively younger athletes maintain their participation in sport, despite being at a relative age disadvantage. As such, future research is warranted to explore the range of consequences associated with the RAE and how existing frameworks can be adapted to account for these outcomes.

Similarly, consideration of the RAE within PYD frameworks may be necessary to account for the influence that relative age disparities can have on sport participation (e.g., engagement versus dropout) and PYD. Many PYD frameworks emphasize the importance of the developmental context, the design of sport programs, and individual variables (e.g., Côté, Turnnidge, & Evans, 2014; Côté, Turnnidge, & Vierimaa, 2016; Fraser-Thomas, Côté, & Deakin, 2005; Holt et al., 2017); however, these models do not fully capture how the interaction between date of birth and grouping policies can foster inequities. While well-intended, such age-grouping practices can cultivate sport environments that provide advantages to some and disadvantages to others that can persist across the lifespan. Consequently, this undermines opportunities for athletes to experience positive health and psychosocial outcomes of sport. Therefore, relative age may be an important factor for consideration in future PYD work. This may be particularly relevant within the *Applied Sport-Programming Model of Positive Youth Development* (Fraser-Thomas et al., 2005), as it recognizes the ways in which athletes may be introduced to sport (i.e., sampling, specialization, and investment), which aligns with the selection and maturational processes that can foster RAEs (Smith, 2019).

Consistent with Cobley et al.'s (2009) call for methods to minimize the RAE, several potential solutions (e.g., bio-banding; Cumming, Lloyd, Oliver, Eisenmann, & Malina, 2017, age-ordered shirt numbering; Mann & van Ginneken, 2017; corrective adjustments; Romann & Cobley, 2015) have been proposed in the literature (see Webdale, Baker, Schorer, & Wattie, 2019 for a full review of RAE solutions). This dissertation addresses Cobley et al.'s call for a better understanding of the implications of relative age on human development by exploring its influence on PYD.

Relative age effects continue to be pervasive and persistent, yet difficult to solve because of their nuanced mechanisms and manifestations (Baker et al., 2020). This complexity calls for a number of future research directions. Experimental research is needed in order to explore the mechanisms that contribute to the RAE, as well as to test the effectiveness of proposed solutions. For example, bio-banded soccer tournaments (Cumming et al., 2017) and age-order shirt numbering (Mann & van Ginneken, 2017) are promising approaches to help mitigate RAEs, but these methods are still relatively new and need further testing and application in multiple sport settings. Despite the number of solutions that exist in the current RAE literature, many have failed to garner the attention of many sport policy makers, identifying a possible disconnect between researchers and sport administrators. As such, researchers may want to consider using participatory action research (Frisby, Reid, Millar, & Hoerber, 2005) to ensure sport practitioners are well-informed and have agency and ownership in implementing solutions to the RAE. In this vein, a shift in research designs, such as qualitative studies with sport stakeholders (e.g., coaches, parents, athletes, administrators) would provide rich insights into the role of social factors in the manifestations of the RAE. Mixed method approaches would allow

the triangulation of data, and a greater understanding of the origins of the RAE and the types of interventions needed to minimize this effect (Baker et al., 2020). Expanded use of multivariate statistical procedures (e.g., ANOVAs, MANOVAs, structural equation modelling) would allow researchers to account for the various mechanisms contributing to RAEs, but also to predict key outcomes by accounting for various mediating and moderating variables (Baker et al., 2020). Further development and testing of the theoretical and conceptual frameworks of the RAE is also warranted. Expanding the statistical procedures and methodological designs of studies will help support the development of these frameworks as these procedures will allow possible casual factors to be tested and/or accounted for (Baker et al., 2020).

Research suggests that relatively younger athletes are more likely to drop out of sport (e.g., Lemez, Baker, Horton, Wattie, & Weir, 2014); however, additional research is needed to determine if relative age (or related factors) were a consideration in athletes' cessation from sport. If sport is an avenue that can afford athletes PYD outcomes, then this area of future inquiry is critically important in order to mitigate athlete dropout. The concept of the 'underdog hypothesis'¹⁵ is a relatively new research area, and of the studies that have been conducted, most have occurred within the context of professional male sport (e.g., Gibbs, Jarvis, & Dufur, 2011), identifying a need for further investigations of female sport (Smith, 2019). These studies are needed to determine which factors (e.g., psychological, physical, structural) contribute to relatively younger athletes becoming better and more sought after. Lastly, aligning with the focus of the current studies, future research should explore how relative age may influence other

¹⁵ See chapter 3 for more information about the underdog hypothesis.

psychosocial constructs such as self-esteem, confidence, and enjoyment. These insights would prove valuable to better understand athletes' sport experiences and possible reasons for dropout.

Conclusion

Decades of RAE research exists within the sport, education, and health domains. Within this area of research, quantitative approaches have been the primary method to determine how relative age and individual, task, and environmental constraints affect sport participation rates. This dissertation advances this line of inquiry through exploring possible connections between relative age and PYD. Moreover, Chapter 4 of this dissertation is one of the first known studies to rely on a qualitative approach to capture the unique perceptions of athletes' experiences in sport, while considering their relative ages. This permitted a greater understanding of the developmental outcomes female ice hockey players are experiencing, as well as the mechanisms and processes that contributed to their attainment. These findings highlight the critical role that social agents, particularly coaches, have in shaping youth sport experiences, emphasizing the need for coaches to create a sport environment conducive to PYD. Results from this dissertation can be used by practitioners to deliver sport that fosters PYD. This work can serve as a foundation for future studies to examine how relative age could influence other psychosocial measures as well as encourage other researchers to move beyond cross-sectional quantitative studies in order to better understand athletes' experiences in sport. Furthermore, this information can be shared with relevant sport stakeholders (e.g., coaches, youth program designers) to help design sport environments that facilitate PYD for all athletes involved.

REFERENCES

- Andronikos, G., Elumaro, A. I., Westbury, T., & Martindale, R. J. J. (2016). Relative age effect: Implications for effective practice. *Journal of Sports Sciences, 34*, 1124-1131.
- Baker, J., Chittle, L., Horton, S., & Dixon, J. C. (2020). Concluding thoughts and future research on relative age effects in sport. In J. C. Dixon, S. Horton, L. Chittle., & J. Baker (Eds.), *Relative age effects in sport: International perspectives*. New York: Routledge.
- Chelladurai, P., & Saleh, S. D. (1980). Dimensions of leader behavior in sports: Development of a leadership scale. *Journal of Sport Psychology, 2*, 34-45.
- Chittle, L., Horton, S., Weir, P., & Dixon, J. C. (2017a). Investigating the relationship between the relative age effect and leadership behaviors among male ice hockey players. *International Review for the Sociology of Sport, 52*(6), 751-768.
- Chittle, L., Horton, S., Weir, P., & Dixon, J. C. (2017b). Exploring the relationship between relative age effect and youth development among male recreational ice hockey players. *Journal of Amateur Sport, 3*(1), 79-95.
- Cobley, S., Baker, J., Wattie, N., & McKenna, J. M. (2009). Annual age-grouping and athlete development: A meta-analytic review of relative age effects in sport. *Sports Medicine, 39*(3), 235-256.

- Côté, J., & Fraser-Thomas, J. (2011). Youth involvement and positive development in sport. In P. R. E. Crocker (ed.), *Sport psychology: A Canadian perspective* (2nd ed., pp. 226-255). Toronto: Pearson Prentice Hall.
- Côté, J., Turnnidge, J., & Evans, M. B. (2014). The dynamic process of development through sport. *Kinesiologia Slovenica*, 20(3), 14-26.
- Côté, J., Turnnidge, J., & Vierimaa, M. (2016). A personal assets approach to youth sport. In A. Smith & K. Green (Eds.), *Handbook of youth sport* (pp. 243-254). London, UK: Routledge.
- Cumming, S. P., Lloyd, R. S., Oliver, J. L., Eisenmann, J. C., & Malina, R. M. (2017). Bio-banding in sport: Applications to competition, talent identification, and strength and conditioning of youth athletes. *Strength and Conditioning Journal*, 39(2), 34-47.
- Fumarco, L., Gibbs, B. G., Jarvis, J. A., & Rossi, G. (2017). The relative age effect reversal among National Hockey League elite. *PLoS ONE*, 12(8), e0182827.
- Fraser-Thomas, J. L., Côté, J., & Deakin, J. (2005). Youth sport programs: An avenue to foster positive youth development. *Physical Education and Sport Pedagogy*, 10(1), 19-40.
- Frisby, W., Reid, C., Millar, S., & Hoeber, L. (2005). Putting “participatory” into participatory forms of action research. *Journal of Sport Management*, 19, 367-386.

- Gibbs, B. G., Jarvis, J. A., & Durling, M. J. (2011). The rise of the underdog? The relative age effect reversal among Canadian-born NHL hockey players: A reply to Nolan and Howell. *International Review for the Sociology of Sport*, 47(5), 644-649.
- Hancock, D. J., Adler, A. L., & Côté, J. (2013). A proposed theoretical model to explain relative age effects in sport. *European Journal of Sport Science*, 13(6), 630-637.
- Hancock, D. J., Ste-Marie, D. M., & Young, B. W. (2013). Coach selections and the relative age effect in male youth ice hockey. *Research Quarterly for Exercise and Sport*, 84(1), 126-130.
- Holt, N. L., Neely, K. C., Slater, L. G., Camiré, M., Côté, J., Fraser-Thomas, J., . . . Tamminen, K. A. (2017). A grounded theory of positive youth development through sport based on results from a qualitative meta-study. *International Review of Sport and Exercise Psychology*, 10(1), 1-49.
- Lemez, S., Baker, J., Horton, S., Wattie, N., & Weir, P. (2014). Examining the relationship between relative age, competition level, and dropout rates in male youth ice-hockey players. *Scandinavian Journal of Medicine & Science in Sports*, 24(6), 935-942.
- MacDonald, D. J., Côté, J., Eys, M., & Deakin, J. (2012). Psychometric properties of the youth experience survey with young athletes. *Psychology of Sport and Exercise*, 13, 332-340.

- Mann, D. L., & van Ginneken, P. J. M. (2017). Age-ordered shirt numbering reduces the selection bias associated with the relative age effect. *Journal of Sports Sciences*, 35(8), 784-790.
- McCarthy, N., & Collins, D. (2014). Initial identification & selection bias versus the eventual confirmation of talent: Evidence for the benefits of a rocky road? *Journal of Sports Sciences*, 32(17), 1604-1610.
- Neely, K. C., & Holt, N. L. (2014). Parents' perspectives on the benefits of sport participation for young children. *The Sport Psychologist*, 28, 255-268.
- Romann, M., & Cobley, S. (2015). Relative age effects in athletic sprinting and corrective adjustments as a solution for their removal. *PLoS One*, 10(4), e0122988.
- Sherar, L. B, Baxter-Jones, A. D. G., Faulkner, R. A., & Russell, K. W. (2007). Does physical maturity and birth date predict talent in male youth ice hockey players? *Journal of Sports Science*, 25(8), 879-886.
- Smith, K. L. (2019). *The role of relative, community size, and positive youth development on female youth soccer participation*. (Unpublished doctoral dissertation). University of Windsor, Windsor.
- Smith, K. L., Weir, P. L., Till, K., Romann, M., & Cobley, S., (2018). Relative age effects within female sport contexts: A systematic review and meta-analysis. *Sports Medicine*, 48(6), 1451-1478.

- Wattie, N., Schorer, J., & Baker, J. (2015). The relative age effect in sport: A developmental systems model. *Sports Medicine*, *45*(1), 83-94.
- Wattie, N., Sornberger, B., & Fraser-Thomas, J. (2018). The influence of relative age on youths' developmental experiences in sport. *Journal of Exercise, Movement, and Sports (A SCAPPS Publication)*, *50*(1). Retrieved from <https://www.scapps.org/jems/index.php/1/article/view/1906>
- Webdale, K., Baker, J., Schorer, J., & Wattie, N. (2019). Solving sport's 'relative age' problem: A systematic review of proposed solutions. *International Review of Sport and Exercise Psychology*. doi: 10.1080/1750984X.2019.1675083

TABLES

Table 1

Pearson Correlations for the Five Dimensions of the Leadership Scale for Sport

| | TI | DB | AB | SS | PF |
|----|----|-------|-------|-------|--------|
| TI | - | .604* | .302* | .619* | .410* |
| DB | | - | .034 | .681* | .602* |
| AB | | | - | -.020 | -.139* |
| SS | | | | - | .602* |
| PF | | | | | - |

Note. TI = training and instruction; DB = democratic behavior; AB = autocratic behavior; SS = social support; PF = positive feedback.* $p < .05$

Table 2

Means and Standard Deviations for Leader Behaviors of Athletes Based on Quartile of Birth

| Leadership subscales | Q1 | Q2 | Q3 | Q4 |
|--------------------------|---------------|--------------|--------------|--------------|
| Training and instruction | 3.236(0.553) | 3.271(0.575) | 3.246(0.760) | 3.212(0.667) |
| Democratic behavior | 3.678 (0.510) | 3.760(0.559) | 3.757(0.613) | 3.671(0.628) |
| Social support | 3.718(0.698) | 3.979(0.582) | 3.782(0.651) | 3.721(0.743) |
| Autocratic behavior | 2.623(0.657) | 2.418(0.659) | 2.397(0.619) | 2.569(0.694) |
| Positive feedback | 4.132(0.687) | 4.343(0.596) | 4.231(0.561) | 4.183(0.702) |

Note. Q1 = Quartile one; Q2 = Quartile two; Q3 = Quartile three; Q4 = Quartile four

Table 3

Means and Standard Deviations for Leader Behaviors of Formal and Informal Leaders, Structural Coefficients for Discriminate Analysis, and Standardized Canonical Discriminate Function Coefficients

| Leadership subscales | <i>Formal Leaders</i> | <i>Informal Leaders</i> | <i>Structural Coefficients</i> | <i>Standardized Canonical Coefficients</i> |
|--------------------------|-----------------------|-------------------------|--------------------------------|--|
| Training and instruction | 3.397(.585) | 3.181(.639) | 0.596* | 0.025 |
| Democratic behavior | 3.881(.473) | 3.643(.598) | 0.723* | 0.071 |
| Social support | 4.079(.561) | 3.705(.686) | 0.983* | 0.829 |
| Autocratic behavior | 2.470(.750) | 2.513(.631) | -0.112 | -0.097 |
| Positive feedback | 4.407(.464) | 4.144(.686) | 0.708* | 0.153 |

Note: Wilks' Lambda = 0.943, $X^2(5) = 13.982$, $p = 0.016$; * significantly discriminated between formal and informal leaders

Table 4

Means (Standard Deviations) for YES-S Based on Quartile of Birth

| YES-S subscales | α | Q1 | Q2 | Q3 | Q4 | Overall |
|--------------------------|----------|------------|------------|------------|------------|------------|
| Personal & social skills | .83 | 3.40(0.39) | 3.41(0.39) | 3.43(0.37) | 3.31(0.41) | 3.39(0.39) |
| Cognitive skills | .73 | 2.46(0.69) | 2.44(0.66) | 2.33(0.66) | 2.37(0.67) | 2.41(0.67) |
| Goal setting | .66 | 3.41(0.46) | 3.41(0.46) | 3.37(0.53) | 3.34(0.46) | 3.39(0.48) |
| Initiative | .56 | 3.64(0.34) | 3.60(0.37) | 3.67(0.40) | 3.62(0.33) | 3.63(0.36) |
| Negative experiences | .81 | 2.03(0.54) | 1.89(0.53) | 1.81(0.45) | 1.86(0.52) | 1.91(0.52) |

Note. α = Internal consistency; Q1 = Quartile one; Q2 = Quartile two; Q3 = Quartile three; Q4 = Quartile four

Table 5.

Participant Demographics

| Participant ID | Month of birth | Age at interview |
|----------------|----------------|------------------|
| Participant 1 | June | 16 |
| Participant 2 | June | 18 |
| Participant 3 | April | 18 |
| Participant 4 | June | 17 |
| Participant 5 | May | 16 |
| Participant 6 | May | 18 |
| Participant 7 | June | 17 |
| Participant 8 | May | 18 |
| Participant 9 | June | 17 |
| Participant 10 | May | 17 |
| Participant 11 | October | 18 |
| Participant 12 | November | 17 |
| Participant 13 | October | 17 |
| Participant 14 | October | 16 |
| Participant 15 | October | 16 |
| Participant 16 | October | 18 |
| Participant 17 | December | 16 |
| Participant 18 | October | 16 |
| Participant 19 | December | 16 |
| Participant 20 | December | 16 |

Table 6

PYD Outcomes

| PYD Outcomes | Sample Quote |
|-----------------|--|
| Personal domain | <p>“I’m actually a really shy person, but with hockey, I’m never shy with anyone... even with try-outs, when there’s a room of brand-new girls, I’m not shy, whereas I would be in like a classroom full of new people. So, hockey [has] definitely helped my confidence.” (Participant 19)</p> <p>“[Hockey’s] really made me who I am in school because I’m starting to become more vocal and I’m starting to get involved more in school, with other people, and I really stepped up and said what I thought, giving my opinion.” (Participant 18)</p> |
| Social domain | <p>“my communication was developed because I was given responsibilities from when I was really young. So, they’d be like, “okay, [name], you’re going to go and address 20 people in this meeting.” (Participant 6)</p> <p>“A lot of social skills, just being able to be in a team environment and instead of putting yourself first, put the team first and recognizing when it’s your turn to shine.” (Participant 16)</p> |
| Physical domain | <p>“[Hockey’s] a sport so it kept me physically active and staying in good shape. [It] motivated me to keep eating healthy too. And, I think it just helps with your brain mentally, to stay more awake so I could study better.” (Participant 2)</p> <p>“Definitely my stick handling, those skills, I definitely developed really quickly; you have to [be] very good at it in higher level[s] of hockey. Physical endurance, I find that translates well to other sports that I’m doing right now...even in the workplace, lifting things and being fast with making drinks... I find that hockey really helped me out.” (Participant 11)</p> |

Note. Sample quotes do not represent the full list of PYD outcomes developed by athletes. For a detailed description of these outcomes, please contact the lead author.

Table 7

Contexts Where PYD Outcomes Were Applied

| Context | Sample Quote |
|-------------------------------|--|
| School | <p>“Even in school ... when we had to do group projects, I was definitely the leader in there making sure that everyone was communicating with each other and ... all of our work in on [the] deadlines... I was the one [who] was organizing everything and I was the one that was making sure that everyone's work was in.” (Participant 11)</p> <p>“I struggled with collaboration and group work in school, but this year especially, I have to rely on the kids in my class and we have such small classes that we all work together anyways, so that's really helped and I never would've done that... if it finally hadn't clicked and I hadn't had hockey to practice.” (Participant 10)</p> |
| Relationships | <p>“I have friends...with really bad anxiety so being a leader and making sure that everyone's comfortable coming to me at hockey also helps me [to] make sure that my friends at school are comfortable talking to me, especially when they have anxiety and problems at school.” (Participant 19)</p> <p>“I remember when ...I started high school I was kind of afraid to make friends... but now if I go to Tim's and I see someone from an older grade, I'm going to talk to them instead of being afraid of them because I know that the girls on my team are a year older or last year, two years older and we still got along.” (Participant 1)</p> |
| Volunteering/extracurriculars | <p>“I take on leadership positions, with all my school's extracurriculars. Now I'm at university, I've had that confidence that I know I can lead so I'm applying for a bunch of clubs within our program.” (Participant 6)</p> <p>“the skills from hockey [have] helped me with student counseling because I've only been on it this year but ...I definitely feel that it helps me with hockey sometimes because I mean you're working with a big group of people and you have to kind of take into consideration everyone's ideas. Sometimes it happens in hockey too, in the dressing room we'll</p> |

| | |
|------|--|
| | think of little things to do, little plays, and it all kind of just comes together.” (Participant 20) |
| Work | <p>“...on the ice I'm a very nice player and I kind of learned how to be respectful and nice and so translating [that] into [the] workplace, I'm very respectful with all the customers, very responsible with all my coworkers, so learning that at a young age was very beneficial for me.” (Participant 11)</p> <p>“..I work at a day camp, so being able to cooperate with my partner, make[ing] sure we have all the kids at all the times... sports taught me all that.” (Participant 3)</p> |

Note. Sample quotes do not represent the full list of contexts where PYD outcomes were applied. For a detailed description of these contexts, please contact the lead author.

FIGURES

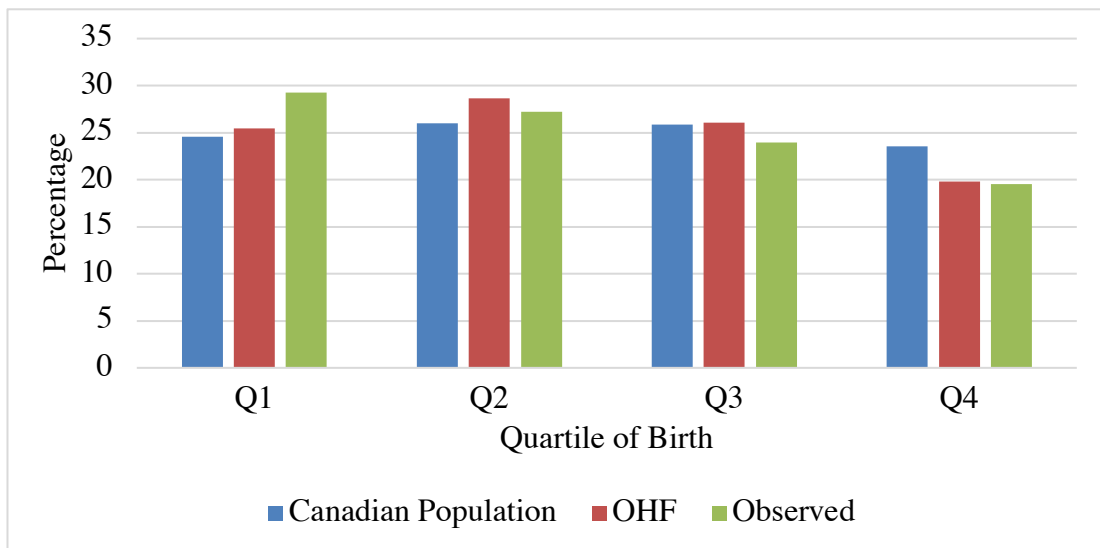


Figure 1. Overall birth distribution by quartile. Expected distributions were derived from the Human Fertility Database in Canada between 2000 and 2002, and Ontario Hockey Federation (OHF) birthrates for 'Midget' girls (Hancock, 2017).

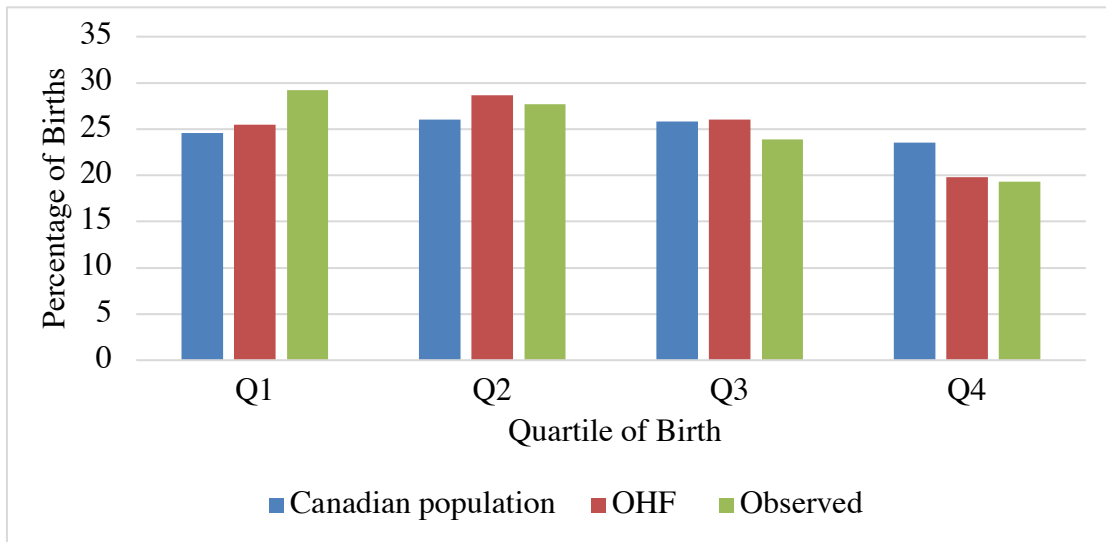


Figure 2. Overall birth distribution by quartile. Expected distributions were derived from the Human Fertility Database in Canada between 2000 and 2002, and Ontario Hockey Federation (OHF) birthrates for “Midget” girls (Hancock, 2017).

APPENDICES

Appendix A: Researcher's Role

As an individual born in January, I am aware of the potential advantages that can be afforded to relatively older individuals. The relative age effect (RAE) is a function of multiple interacting constraints and within the context of sport I do not recall experiencing substantial advantages as a result of my relative age. However, I believe this perspective is a result of my entry into sport, where I sampled multiple sports at a young age (e.g., figure skating, basketball, soccer) and/or a lack of awareness of where my birthdate fell relative to my teammates.

I view sport as an organized activity that is not inherently positive but, instead, through careful design and implementation, can offer youth an opportunity to develop and/or practice a range of positive youth development (PYD) outcomes. Critical to the sport environment is a supportive social environment consisting of trained coaches, supportive parents, and welcoming peers. This perspective is informed by completing courses in youth sport and immersing myself in the PYD and RAE literatures. While I have not previously played ice hockey, I have experienced participating in numerous competitive team and individual sports at various levels that shaped the interpretations of my studies' findings. My sport experiences highlight the seemingly disproportionate impact social agents can have on whether a sport experience is positive or negative, and the lessons that can be learned from each experience. While I generally enjoyed the sports that I participated in, whether my overall experience in a particular season was positive or negative depended upon social rather than competitive outcomes. In my

experience, coaches set task- or ego-oriented goals for a team and this appears to influence whether their interactions with athletes are intended to bolster the athletes' character and experience or as a means to increase their chances of winning.

As an adolescent, I was coached for numerous years by police officers who stressed the importance of sport as an opportunity to develop good character. These experiences taught me that sport can offer an avenue to impart or reinforce positive values, but most importantly, it is the methods used to facilitate these values that are seemingly critical to the sport experience. With different coaches I also experienced how individuals in this role could turn a sport that I enjoyed into something I dreaded based upon how they interacted with me, my teammates, and parents. Through my own sporting experiences, I view sport as having the potential to foster PYD, but ultimately whether this occurs is determined through social interactions.

My familiarity with the literature and experiences in sport may have shaped the decisions I made and the findings within this dissertation. Specifically, the sport and age category selected for studies one and two were determined for theoretical reasons informed by the RAE literature. Specifically, I wanted to target female ice hockey, which has consistently displayed a RAE and recruit a post-adolescent sample in order to examine how relatively younger athletes are able to overcome initial selection biases and maintain their involvement in competitive sport. Within study three, I utilized an interpretive phenomenological approach. This methodology recognizes that researchers have an active role in cogenerating interpretations often shaped by their 'preunderstandings' and experiences. While my sport experiences and perceptions of relative age may have shaped my interpretations by learning toward certain themes, I

maintained a self-reflexive journal throughout the research process as a means to minimize undue bias.

Appendix B: Interview Guide

Thank you for agreeing to participate in this study about your ice hockey experiences. I'm interested in learning how your date of birth may have influenced your current and previous ice hockey experiences.

As we discussed previously, I would like to record this interview with your permission. The recording of our interview will ensure that I have accurate documentation of the information that you share with me. Please let me know if at any point you would like me to stop recording. Do you have any questions before we start? Please do not hesitate to ask me questions at any point during the interview.

Background questions:

1. What is your date of birth?
2. What level of ice hockey are you currently playing?
3. How old were you when you started playing hockey?

Positive youth development:

1. Why did you start to play hockey?
 - Probe about relationships with friends
 - Probe about the influence of family
2. What type of skills have you developed playing ice hockey?
 - Probe about PYD factors (initiative, cognitive skills, personal/social skills, goal setting)
 - In setting personal goals for yourself, what type of goals do you set for yourself? What **steps** do you take to achieve these goals? (initiative/goal setting)
 - What have you learned while playing ice hockey? (e.g., technical skills/cognitive skills/social skills such as player positioning, visioning of ice, reading play, decision making, strategic play, pro-social and anti-social behaviours).
 - Outside of hockey related skills, what additional skills have you developed because of your involvement in hockey? (e.g., resiliency, mental toughness, time management, communication, respect, teamwork, personal skills, social skills etc.)
 - Describe any skills that you have learned in hockey that you have been able to transfer to other avenues in your life (e.g., school, personal relationships).

3. How would you describe your experience with your current and previous hockey coach(es)?

- Probe about one-on-one training time, coaching styles, feedback type and frequency, coach favouritism, and encouragement.

4. Outside of coaches, how is leadership demonstrated on your team?

- Probe: What types of roles/responsibilities do the captains and alternative captains (leaders) hold on your team?
- Probe: In addition to captains/alternative captains, would you describe anyone else as a leader on your team and why?
- Probe: How would you describe yourself as a leader? What type of leadership roles do you take on within your team?
- Probe: Tell me about a time you faced a challenge while being the team leader?
- Probe: In what ways, if any, do you believe your leadership skills on this team have developed through your participation in hockey?
- Probe: Tell me about a time you have held a leadership role outside of this team (e.g. in school, work, volunteer, etc). How did this help you be a leader on your team or vice versa?

Would it be okay to contact you with some follow-up questions if I need to clarify anything we talked about today?

Closing statement

Thank you for your time. Is there anything that you would like to clarify or add? If you think of anything later, feel free to contact me.

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