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Youth Developmental Experiences Among Female Hockey Players: The Role of Relative Age

Laura Chittle
University of Windsor
chittlel@uwindsor.ca

Jess C. Dixon
University of Windsor
jdixon@uwindsor.ca

Sean Horton
University of Windsor
hortons@uwindsor.ca

Abstract

*Relative age differences can lead to varying sport participation opportunities; however, scant research has focused on the impact of relative age on experiences within sport. This study explored if youth developmental experiences differed by relative age among competitive female ice hockey players. Players within Ontario (*n *= 264) completed an online survey that contained the Youth Experience Survey for Sport (YES-S) along with additional demographic questions. The YES-S measures 5 dimensions of positive (i.e., personal and social skills, cognitive skills, goal setting, and initiative) and negative developmental experiences in sport. The results of the multivariate analysis of variance (MANOVA) suggested that the developmental experiences reported by athletes did not differ across birth quartiles (Wilks' Lambda = 0.940,* F *(15, 707.105) = 1.061,* p *= .390). Although there was a relative age effect (RAE) trend within this sample of competitive female ice hockey players, the differences across birth quartiles were not statistically significant. It appears that relative age does not result in youth having different positive and negative sporting experiences. Exploring the characteristics of sport environments (e.g., coaches, practices) and personality traits of competitive athletes to better understand how relatively younger athletes continue their participation in sport despite being at a perceived disadvantage warrants further investigation.*

Key words: relative age effect, youth developmental experiences, female ice hockey, MANOVA

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 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 characteristics of individuals (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, Chittle, Horton, Weir, and Dixon (2017) were the first to investigate 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 suggest 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., Cobley, Baker, Wattie, & McKenna, 2009). While growing in interest among researchers, there continues to be comparatively fewer investigations on female hockey (Smith, Weir, Till, Romann, & Cobley, 2018). At the elite level, Wattie, Baker, Cobley, 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 quartile[1] 2) 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 1 through 4. 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 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 2. Generally, across these studies, there were more relatively older players than younger players, with quartile 2 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 2 rather than a gradual decline from quartiles 1 to 4 (e.g., Hancock, 2017). Proposed hypotheses for this quartile 2 overrepresentation include quartile 1 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 2 female players were also the most overrepresented among girls competing within boys' ice hockey leagues across multiple age divisions.

[1] 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.

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, & Cobley, 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 2017-2018[2]. 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;

[2] 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).

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 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 (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 1 contained those individuals born in January, February, and March, quartile 2 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 Windsorizing 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.

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 1, 73 (27.7%) in quartile 2, 63 (23.9%) in quartile 3, and 51 (19.3%) in quartile 4. When relying on Canadian population birth rates as the expected distribution, the chi-square goodness of fit test was not significant ($\chi^2 = 4.952$, $df = 3$, $p = .175$; see Figure 1). When utilizing the OHF birthdate distribution (Hancock, 2017), the chi-square goodness of fit test also failed to research statistical significance ($\chi^2 = 2.029$, $df = 3$, $p = .566$; see Figure 1). 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, $F(15, 707.105) = 1.061$ $p = .390$, $\omega^2_{mult} = 0.049$)[3]. Therefore, it appears that quartile of birth does not differentiate youth developmental experiences. See Table 1 for a summary of the YES-S scores across quartile of birth.

[3] 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 would not reach 0.7. For initiative, deleting any of the items would have reduced the reliability score.

Figure 1. Comparison of Overall Birth Distributions by Quartile

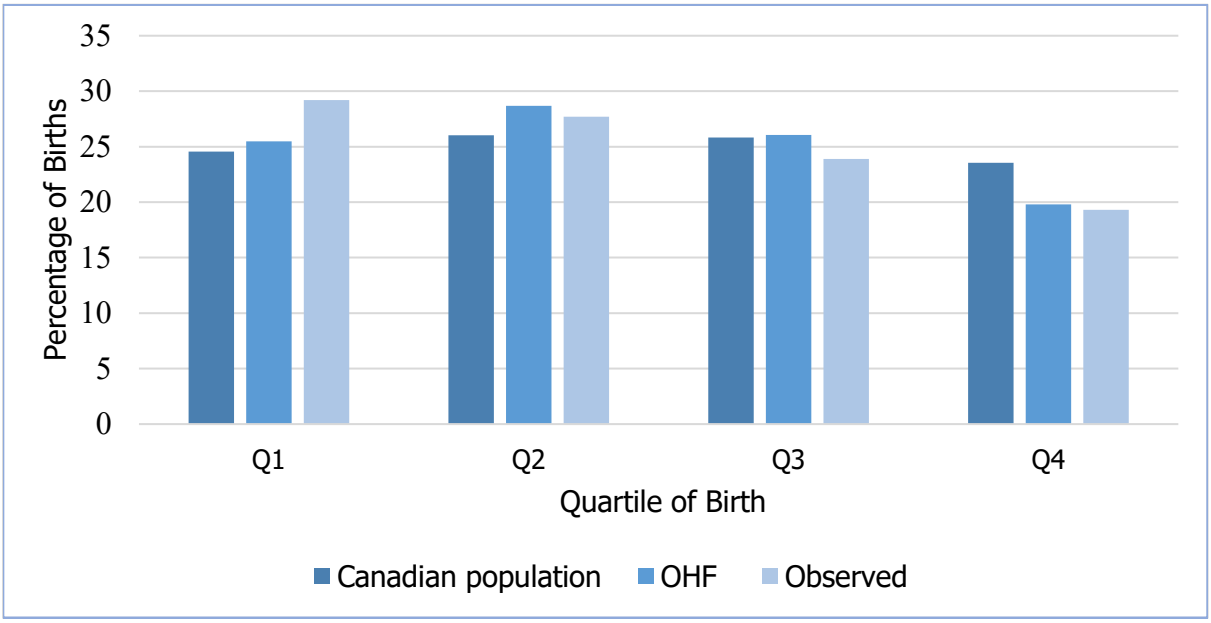

Figure 1. Expected distributions were derived from the Human Fertility Database in Canada between 2000 and 2002, and Ontario Hockey Federation (OHF) birthrates for "midget" girls (Hancock, 2017).

Table 1. Means (Standard Deviations) for YES-S Scores 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 1; Q2 = Quartile 2; Q3 = Quartile 3; Q4 = Quartile 4

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 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 2.

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 sport as an outlet for athletes to experience PYD outcomes (e.g., respect, teamwork, active living) and has been linked with sport dropout (e.g., Lemez et al., 2014). 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 & Cobley, 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. 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, 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.

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