JOURNAL OF AMATEUR SPORT
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Examining the Role of Relative Age on Leadership Behaviors among Female Ice Hockey Players: An Exploratory Investigation

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The aim of this study was to examine the influence of relative age on self-reported leadership behaviors among competitive female ice hockey players. Secondary purposes included examining whether a relative age effect (RAE) was present within the sample and if leadership behaviors differed according to leader status (i.e., formal versus informal leaders). Canadian female ice hockey players (ages 15-18 years) completed an online survey that contained the Leadership Scale for Sport along with additional demographic questions. Players were segmented into birth quartiles based upon Hockey Canada's selection date and classified by leadership status. The MANOVA suggested that the frequency of leadership behaviors displayed by these athletes did not differ across birth quartiles. Furthermore, although there was a RAE trend within this sample of competitive female ice hockey players, the differences relative to population distributions were not statistically significant. Finally, formal leaders (i.e., captains/alternate captains) reported higher levels of social support, positive feedback, democratic behavior, and training and instruction than informal leaders. It appears that relative age is not a discriminating factor with respect to leadership behaviors. Competitive female ice hockey may be an avenue for all players, regardless of their date of birth, to develop and demonstrate leadership.

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 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, Starkes, & Van Winckel, 1998). This additional training can lead to accumulated advantages for relatively older athletes that persists 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; Cobley et al., 2009b).

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, 2017b; 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)[1] 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. 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

[1] For a detailed description of the MML please see Chelladurai (2007).

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., Cobley 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, 2017a). Chittle et al. (2017a) 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 et al., 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 et al. (2017a) 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 two[2]. 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 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, Seal, 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

[2] 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.

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, Seal, 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).

Methods

Sample and Recruitment

Competitive (i.e., where coach selections are made) female ice hockey players (m_{age} ~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 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 measures 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 (*a*) 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 et al., 2017; Chittle et al., 2017a). 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 (2017a) 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

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.
*$p < .05$

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.

Four of the five LSS subscales had acceptable internal consistencies: training and instruction α = .86, democratic behavior α = .74, social support α = .79, and positive feedback α = .77. Consistent with prior research (e.g., Chittle et al., 2017; Crozier et al., 2017), autocratic behavior (α = .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 analyses 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)[3]. 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.

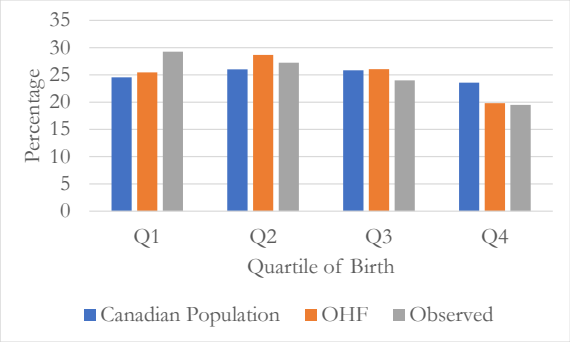

Figure 1. Overall birth distribution by quartile. Expected distributions were derived from the Human Fertility Database in Canada between 2000 and 2002, and Ontario Hockey Federation (OHF) birthrates for 'Midget' girls (Hancock, 2017).

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

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

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(0687)	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

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, ω^2_{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 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 leaders (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

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	*Formal Leaders*	*Informal Leaders*	*Structural Coefficients*	*Standardized Canonical Coefficients*
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

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, 2017b; 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 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. However, we found that 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 et al., 2017; Chittle et al., 2017a). 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 amongst 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 ath-

letes 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., Cobley 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 et al. (2017a), 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 (Voeker 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;

Price & Weiss, 2013), 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), 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. 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.

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