Comparing psychological constructs in early specializing and sampling male hockey players

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ABSTRACT

Athletes who specialize early often invest more into their sport from a young age. It has been suggested early specializers feel greater pressure to perform and, as a result, have higher levels of anxiety or on the contrary may have developed better coping strategies than their sampling peers. This study focused on understanding differences between early specializers and samplers on relevant psychological constructs (competitive state anxiety, competitive trait anxiety, and personality). Participants were divided into groups based on a modified version of the Developmental History of Athletes Questionnaire (Hopwood, Farrow, MacMahon, & Baker, 2015) and independent sample t-tests considered between group differences. There were no significant differences between early specializers and samplers for competitive state anxiety, competitive trait anxiety, or the big five personality traits. Results highlight the need for further investigation into differences between early specializers and samplers.

Keywords:
Early specialization – youth – sport – competitive anxiety – personality

Citation:

Introduction

In recent years there has been a growing trend in western nations for young people participating in sport to specialize early (Feeley, Agel, & LaPrade, 2016; Jayanthi, Pinkham, Dugas, Patrick, & LaBella, 2013) and considerable research over the past two decades has focused on the potential benefits and negative outcomes associated with early specialization. Much of this work has been guided by the Developmental Model of Sport Participation (DMSP; Côté, 1999; Côté & Fraser-Thomas, 2016; Côté & Hay, 2002), which proposes two different athlete trajectories towards an elite level of performance. In the first, athletes participate in many sports as a child and progress to specialize and invest in one sport (i.e., early sampling trajectory). In the second, athletes bypass the sampling stage and begin with sport specialization during childhood (i.e., early specialization) (Côté & Fraser-Thomas, 2016). While there is no consistent definition of early specialization, a commonly adopted one suggests early specialization is year-round training in a single sport at the exclusion of other sports, occurring during the ages of 6-12 (Wiersma, 2000). In 2015, the American Orthopedic Society of Sport Medicine (AOSSM) convened a think tank of experts on early specialization and released a consensus definition. Early specialization was defined by three criteria: (a) participation in intensive training and/or competition in organized sports greater than 8 months per year, (b) participation in one sport at the exclusion of participation in other sports, (c) involving prepubertal (roughly age 12) children (LaPrade et al., 2016). The rationale for early specialization comes from the influential delib-
ate practice framework (Ericsson, Krampe, & Tesch-Römer, 1993). Ericsson and colleagues (1993) noted that expert musicians spent more time in practice aimed at improving performance than their non-expert counterparts. The authors suggested this specific type of training (i.e., activities that were highly effortful, designed for the purpose of improving performance and do not provide instant gratification), which they labeled 'deliberate practice', was the key difference between experts versus non-experts across domains. Importantly, this framework promotes that in order to become an expert, one must engage in a large quantity of deliberate practice, and the more time spent in deliberate practice, the higher the attained level of performance. Further, the authors suggested that if someone starts deliberate practice at a later age, they would be at a disadvantage compared to their peers who began earlier as they would have potentially had less opportunity to accumulate the same amount of deliberate practice hours. Whether it is beneficial in terms of expertise for an athlete to specialize early is a complex and unresolved issue in the field. However, all would agree that becoming an elite athlete requires practice. In a review of literature on sport skill acquisition, researchers concluded that high amounts of deliberate practice are integral to developing expertise across sporting domains (Baker & Young, 2014). This theory underpins the rationale for early specialization; the sooner one begins sport specific deliberate practice, the more likely they are to reach a high level of skill.

There is, however, growing concern, that early specialization can be detrimental to the physiological and psychosocial health of youth. Early specialists experience higher rates and risk of injury as well as higher levels of emotional exhaustion, dropout and burnout (Fraser-Thomas, Côté, & Deakin, 2008; Jayanthi et al., 2013; Strachan, Côté, & Deakin, 2009). Despite the strong consensus statements that have been advanced concerning early specialization (e.g. LaPrade, et al., 2016) very little is known about the differences between athletes who specialize and those who do not, with the exception of the injury and training pattern research mentioned above. In the current study, we examined differences in two key psychological constructs - personality and anxiety – which have been largely overlooked in examinations of the consequences of early specialization (i.e., activities that were highly effortful, designed for the purpose of improving performance and do not provide instant gratification), which they labeled 'deliberate practice', was the key difference between experts versus non-experts across domains. Personality generally reflects stable psychological characteristics that differ between individuals (Larsen & Buss, 2008). The most widely employed model of personality is the five-factor model (FFM) proposed by McCrae and John (1992). The FFM suggests there are five personality traits that everyone possess; openness to experience, conscientiousness, extraversion, agreeableness and neuroticism. Openness to experience manifests in behaviours such as being intellectual, imaginative and creative. Behaviours such as being organized, practical, and prompt are markers of someone who is highly conscientious. Extraversion can be classified by behaviours such as being talkative, social, and assertive. Someone who is high on agreeableness, will display behaviours such as being sympathetic, kind, warm and sincere. Finally, neuroticism, is defined as low emotional stability, and being moody and insecure. While the examination of personality traits among athletes has a long history (e.g., Allen, Greenless, & Jones, 2011; Eglof & Gruhn, 1995; Kirkcaldy, 1982; McKelvie, Lemieux, & Stout, 2003; Piedmont, Hill, & Blanco, 1999), no research has focused specifically on personality traits in relation to children and youths' sport trajectories. Similarly, sport-related measures of anxiety have been largely overlooked in examinations of the consequences of early specialization. Athletes competing in individual sports have reported higher levels of competitive state anxiety (CSA) than those competing in team sports (Flowers & Brown, 2002) and athletes higher in competitive trait anxiety (CTA) respond to competition with greater levels of CSA compared to those with low CTA (Hanton, Mellalieu, & Hall, 2001). Of particular concern are the negative outcomes associated with high competitive anxiety such as decreased performance and increased fear of failure (Aoyagi, Burke, Joyner, Hardy, & Hamstra 2009; Rainey & Cunningham, 1988). It has been suggested that early specialization could lead to higher levels of competitive anxiety, given athletes invest more time and may feel greater pressure to succeed (Baker, Cobley, & Fraser-Thomas, 2009). On the contrary, because of the amount of time spent in a single sport, athletes may be more accustomed to the pressure and may, therefore, have lower levels of competitive anxiety than their non-specializing peers (e.g., those who sample several sports). Additionally, past research has shown competitive anxiety and personality are important factors influencing sport outcomes (Eglof & Gruhn, 1995; Piedmont et al., 1999; Rainey & Cunningham, 1988). As such, this study examined differences between early specialists and samplers on measures of personality and anxiety to determine whether significant differences exist between groups on these outcomes.

Methods

Participants

Participants included 77 male peewee ice-hockey (subsequently referred to as hockey) players (i.e., ages 11-12; no body checking) from seven different teams in the Greater Toronto Area (GTA), Canada. Toronto is arguably one of the most competitive regions in the world to develop as a hockey player as it has produced the greatest number of athletes to make the NHL in North America (Benjamin, 2017). Participants competed at the three highest levels of hockey (i.e., 51.9% played at the A level, 29.9% played at the AA level, and 18.2% played at the highest AAA level). The majority of the sample was Caucasian (81%), having a mean start age in hockey of 5.33 years old (SD = 1.40). Twenty teams were asked to be a part of the study, with coaches of seven teams agreeing for their team members to be approached to participate. Of the potential 119 athletes on these teams, 71% of athletes participated and completed the study.

Procedure

After receiving institutional ethics approval, parental consent, and athlete assent, data were collected from parents and players towards the end of the hockey season (i.e., January and February of
Parents completed a survey that included demographic information (modified from the Developmental History of Athletes Questionnaire (DHQA) a tool that has been shown to have very good to good reliability and validity (Hopwood, 2013). Extensive information regarding involvement in hockey and other organized sports over the past 2 years was collected to determine sport trajectory. Specifically, for each “in season” (i.e., September to March) or “off season” (i.e., April to August), parents were asked to list all the types of organized hockey activities their child participated in and the total hours per week their child participated in these organized hockey activities. Parents were then asked to list all other (non-hockey) organized sports their child was involved in, the number of months their child was involved in each organized sport, and the average number of hours per week that their child was involved in each organized sport. Average hours per week in other sports was summed for each year, to establish a crude estimate of the maximum number of hours each child was participating in other sports (Strachan et al., 2009), which was then compared to the number of hours they were participating in hockey.

Specialization classification was guided by the three criteria suggested by LaPrade and colleagues (2016): participation in intensive training and/or competition in organized sports greater than 8 months per year, (b) participation in one sport at the exclusion of participation in other sports, (c) involving prepupertal (roughly age 12) children. As the age of participants was 11-12 years old, they all met the criteria of being prepupertal. A participant was deemed an early specializer if they only participated in hockey for the duration of the hockey season (i.e., seven months; similar to the 8 months suggested but adapted for a hockey season), and spent a greater amount of time in ice hockey than in other sports over the past two years (i.e., from August 2015 - March 2017) as this was considered participation in one sport to the exclusion of others. In contrast, an athlete was deemed a sampler if they participated in a least one sport other than hockey during the hockey season and spent an equal or greater amount of time in other sports in comparison to hockey over the past two years as this would not meet the criteria of exclusion of other sports.

**Measures**

Players completed surveys measuring competitive state anxiety, competitive trait anxiety and personality in a separate room from parents (i.e. dressing room), with the principal investigator and a least one coach present, to ensure surveys were completed accurately.

The Competitive State Anxiety Inventory-2 Children’s form. The CSAI-2C (Stadulis, MacCracken, Eidson, & Severance, 2002), is a 15-item scale that measures three specific components of competitive state anxiety (i.e., cognitive anxiety, somatic anxiety, and self-confidence). Each subscale contains five items that are assessed on a 4-point scale from 1 (“not at all”) to 4 (“very much”). The CSAI-2C has been found to be psychometrically sound, with strong reliability, validity, and the same original three-factor structure found as the original CSAI-2 (Stadulis et al., 2002).

The Sport Anxiety Scale-2. The SAS-2 (Smith, Smoll, Cumming, & Grossbard, 2006), measures both somatic (physical) and cognitive trait anxiety in competitive settings. The SAS-2 is a 15-item measure that contains three subscales (i.e., somatic anxiety, worry, concentration disruption), each containing five related items. The items are scored on a scale from 1 (“not at all”) to 4 (“very much”). The SAS-2 is preferable to the original Sport Anxiety Scale (SAS; Smith, Smoll, & Schutz, 1990) because it has been shown to be more valid in younger populations (Smith et al., 2006). The SAS-2 has shown strong construct validity and reliability in the desired population (Smith et al., 2006).

The Mini International Personality Item Pool Scale. The Mini IPIP (Donnellan, Oswald, Baird & Lucas, 2006), was created from the International Personality Item Pool (Goldberg, 1992) and contains 20 items, with four items for each of the five assessed traits: (a) Openness to Experience, (b) Conscientiousness, (c) Extraversion, (d) Agreeableness, and (e) Neuroticism. Donnellan and colleagues (2006) showed acceptable internal consistencies and high test-retest reliability, while an exploratory factor analysis of the Mini IPIP indicated the presence of five factors, adding additional support to the structure of the tool (Cooper, Smillie, & Corr, 2010).

**Analyses**

All analyses were performed using SPSS 24.0. Total scores were calculated for each subscale of CSA (i.e., cognitive anxiety, somatic anxiety, confidence), CTA (i.e., somatic anxiety, worry, concentration), each subscale of personality (i.e., openness, contentiousness, extraversion, agreeableness, neuroticism). Cronbach’s alpha was calculated to determine the internal consistency of the scales followed by independent sample t-tests to determine if there were significant differences in anxiety (both CTA and CSA) and/or personality traits between early specializers and samplers.

**Results**

Descriptive statistics are provided in Table 1. Based on the criteria noted above, 43 of 77 (55.8%) participants were classified as early specializers. As expected, there was a significant difference between groups in terms of hours spent in other sports per week for both years t (78) =4.1, p<.001 and t (78) =5.1, p<.001. As the players were on the same teams or competing at similar skill levels, there were no significant differences in terms of hours per week spent in hockey. Having the groups be similar in terms of their hockey participation meant that we could be more confident that any differences found between groups in anxiety scores or personality would be a result of the breadth of sport participation (i.e., single versus multiple sport engagement).
Table 1. Descriptive Statistics of Study Variables by Early Specializers and Samplers.

<table>
<thead>
<tr>
<th></th>
<th>Early Specializers (n = 43)</th>
<th></th>
<th>Samplers (n = 34)</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>%</td>
<td>M</td>
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<tr>
<td><strong>Demographic</strong></td>
<td></td>
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<tr>
<td>Ethnicity (Caucasian)</td>
<td>81.39</td>
<td></td>
<td></td>
<td>82.35</td>
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<tr>
<td>Birth Year 2005</td>
<td>55.8</td>
<td>6.36</td>
<td></td>
<td>61.76</td>
</tr>
<tr>
<td>Birth Year 2004</td>
<td>44.2</td>
<td>6.32</td>
<td></td>
<td>38.24</td>
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<tr>
<td><strong>Specialization</strong></td>
<td></td>
<td></td>
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<tr>
<td>Start age of hockey</td>
<td>5.32</td>
<td>1.40</td>
<td></td>
<td>5.33</td>
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<tr>
<td><strong>Competitive Level</strong></td>
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<td></td>
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<tr>
<td>(A)</td>
<td>46.51</td>
<td></td>
<td></td>
<td>58.82</td>
</tr>
<tr>
<td>(AA)</td>
<td>32.56</td>
<td></td>
<td></td>
<td>26.47</td>
</tr>
<tr>
<td>(AAA)</td>
<td>20.93</td>
<td></td>
<td></td>
<td>14.71</td>
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<tr>
<td><strong>Hours/Week in Sports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hockey (2016/17)</td>
<td>8.93</td>
<td>2.84</td>
<td></td>
<td>8.84</td>
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<tr>
<td>Other sports (2016/17)</td>
<td>3.65</td>
<td>4.14</td>
<td></td>
<td>7.72</td>
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<tr>
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<td>9.03</td>
<td>3.12</td>
<td></td>
<td>8.59</td>
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<tr>
<td>Other sports (2015/16)</td>
<td>3.32</td>
<td>3.42</td>
<td></td>
<td>7.63</td>
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<tr>
<td><strong>Personality</strong></td>
<td></td>
<td></td>
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<tr>
<td>Openness</td>
<td>14.57</td>
<td>2.68</td>
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<tr>
<td>Conscientiousness</td>
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<td>Extraversion</td>
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<td>Agreeableness</td>
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<tr>
<td><strong>Anxiety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSA</td>
<td>23.90</td>
<td>6.77</td>
<td></td>
<td>24.33</td>
</tr>
<tr>
<td>Somatic</td>
<td>8.11</td>
<td>2.86</td>
<td></td>
<td>7.91</td>
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<tr>
<td>Cognitive</td>
<td>8.09</td>
<td>2.84</td>
<td></td>
<td>7.97</td>
</tr>
<tr>
<td>Confidence</td>
<td>7.60</td>
<td>2.50</td>
<td></td>
<td>8.71</td>
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<tr>
<td>CTA</td>
<td>23.32</td>
<td>7.31</td>
<td></td>
<td>21.64</td>
</tr>
<tr>
<td>Somatic</td>
<td>7.68</td>
<td>2.55</td>
<td></td>
<td>6.97</td>
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<tr>
<td>Worry</td>
<td>9.15</td>
<td>3.95</td>
<td></td>
<td>8.24</td>
</tr>
<tr>
<td>Concentration</td>
<td>6.81</td>
<td>1.99</td>
<td></td>
<td>6.42</td>
</tr>
</tbody>
</table>

Note: All personality subscales have a possible score from 5 to 20; CSA and CTA anxiety subscales have a possible score of 5 to 20
Cronbach’s alphas showed good internal reliability for CTA and CSA (.89 and .82 respectively). Independent sample t-tests indicated there were no significant differences on any of the CSA subscales (somatic anxiety, t (73) = -.34, ns; cognitive anxiety, t (74) = -.01, ns; or self-confidence, t (75) = 1.51, ns). Similarly, for CTA, there were no significant differences on the subscales of somatic anxiety t (72) = -.11, ns; worry, t (72) = -.89, ns, or concentration, t (72) = -.98, ns. Further, there were no significant differences on any of the personality sub-scales, indicating no differences between early specializers and samplers.

**Discussion**

This exploratory study examined measures of state and trait competitive anxiety and the “Big 5” personality traits between early specializers and samplers. No significant differences were found for any of the outcomes. This was intriguing as researchers have noted several relationships between personality and different aspects of sport in the past. For instance, studies have found that athletes have higher levels of extraversion compared to the general population (Eglof & Gruhn, 1995; Kirkclady, 1982), as well as significantly lower scores of neuroticism and higher scores of conscientiousness (Kajtina, Tušak, Barić, & Burnik, 2004; McKelvie et al., 2003). Furthermore, this combination of personality traits (higher conscientiousness and lower neuroticism) has also distinguished higher performing and more dedicated athletes from lower level less dedicated athletes (Allen, Greenless, & Jones 2011; Piedmont et al., 1999). A possible explanation for our lack of significant effects may be the age of participants. Specifically, since there are mean-level age differences in the Big Five traits across the life span (Soto, John, Gosling, & Potter, 2011), extraversion, conscientiousness, and neuroticism may manifest themselves differently in relation to training, practice, effort, and investment among older athletes than younger athletes, making differences in sport trajectory based on these traits less prevalent. Further, past research has shown parents are the key influencers in their child’s sport participation (Greendorfer & Lewko, 1978). Given the young age of the participants, parents may have still been playing a primary role in determining athletes as early specializers or samplers, which was based on parent’s involvement and understanding of the information required. Although this study used questions from the DHAQ (Hopwood et al., 2015), a well validated questionnaire, and our categorization was built upon a recognized definition of early specialization (LaPrade et al., 2016), future research may consider developing a more effective categorization tool — specifically ensuring instructions and questions are brief, simple, and clear, to enhance parents’ readability and accurate completion. If athletes are not being categorized properly, this could lead to groups being too homogenous and would in turn result in researchers not being able to find differences between groups that might exist had they been accurately sorted.

It is possible previous research has overstated the psychosocial differences between early specializers and samplers and that there are more similarities than differences. Identifying areas of difference and similarity will be important as this field continues to evolve. As mentioned previously, the definition of early specialization and the subsequent classifying of athletes as early specializers is neither clear nor consistent across this area of research. This limitation has been noted by several researchers; for example, Ferguson and Stern (2014) stated “there is no standardized definition for early sport specialization, with authors providing their own interpretation…. The lack of a concrete definition has led to confusion over what qualifies as early sport specialization” (p. 377-378). Similarly, Buckley et al. (2017) noted “in 2017, the topic of single-sport specialization remains poorly defined, with many unanswered questions” (p.1). Some examples of the different definitions of early specialization include an “early starting age in highly structured and intensive activities with the explicit goal of improving performance in a sport” (Mendes et al., 2018, p.2) while others have used “year-round intensive training in a single sport at the exclusion of other sports” (Post et al., 2017, p.1405) or even “the time when the athlete defined one sport as being more important than other sports” (Moseid, Myklebust, Fagerland, & Bahr, 2019, p. 461). The lack of a coherent definition means the markers for early specialization vary based on study design. While most researchers agree that early specialization pursue primarily one sport from a young age, the “cut off” age for single sport involvement varies depending on the sport and guiding sport participation model (e.g., LTAD, Canadian Sport for Life, 2019; DMSP, Côté, 1999; Côté & Fraser-Thomas, 2016). Further, while some suggest length of training is a key marker (e.g., increased frequency and increased duration of training; Wiersma, 2000), others focus on time spent in activities (e.g., year-round; Hill & Hansen, 1988). Questions remain as to what constitutes “year-round training” or “single sport participation”. In the current study, group categorization was operationalized using criteria from Baker and colleagues’ (2009) definition, but future research needs to establish a consistent definition of early specialization as well as the best method to accurately measure key markers. An important step forward will be to determine what is meant by “early”/“intensive” or “year round”, for example.
This research is timely given the growing trend towards early specialization within youth sport programs, and the potential consequences of early specialization (Fraser-Thomas, Côté, & Deakin, 2005; Law, Côté & Ericsson, 2007; Strachan, et al., 2009). While findings of this study did not find differences in competitive anxiety and personality according to sport trajectory, continued research in the area of sport trajectories is important for understanding the effect of different types of sport participation on youth development and athlete achievement.

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**Competing Interests**

The authors have declared that no competing interests exist.

**Data Availability Statement**

All relevant data are within the paper.

**References**


