The Domain-Specificity of Grit in Sport and School

by

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Abstract

Grit—defined by Duckworth, Peterson, Matthews, and Kelly (2007) as "perseverance and passion for long-term goals" (p. 1087)—has been studied extensively in a variety of achievement settings. Despite the interest that grit has received from researchers over the last decade, a critical conceptual question remains largely unexplored: namely, is grit better conceptualized and measured as a global (i.e., domain-general) construct or as a domain-specific construct? To address this question, this research sought to determine if (a) self-reported grit levels would differ as a function of the situational context that people use when considering their grit responses, and (b) domain-specific measures of grit would explain variance in domain-matched achievement-related criterion variables beyond the variance explained by a global measure of grit. A sample of 251 (149 male, 102 female) intercollegiate (varsity) student-athletes (*M* age = 20.34 years, *SD* = 2.0) completed three versions of the Grit Scale (Duckworth et al., 2007): one version was based upon Duckworth et al.'s original domain-general conceptualization of grit (i.e., no specific situational context was provided to respondents), the second version was situated in the context of sport, and the third version was situated in the context of school (i.e., academic settings). Results of a repeated-measures MANOVA with follow-up mean-contrasts (i.e., dependent *t*-tests with Bonferroni corrections) revealed that student-athletes had significantly higher mean levels of grit in sport than in school and life in general (*p*s < .001). Results of hierarchical regression analyses indicated that the school measure of grit explained significant amounts of unique variance in Grade Point Average beyond the variance explained by the global measure of grit, and the sport measure of grit explained a significant amount of unique variance in perfectionistic strivings in sport beyond the variance explained by the global measure of grit (*ps* < .05). Collectively, the results lend support for the domain-specific conceptualization and measurement of grit in sport and school settings.

Preface

This thesis is an original work by Danielle Cormier. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, project name “Domain-Specificity of Personality Characteristics” (Pro00076187), was approved on October 6th, 2017.

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Chapter 1: Introduction and Literature Review

> Grit is not just a simple elbow-grease term for rugged persistence. It is an often invisible display of endurance that lets you stay in an uncomfortable place, work hard to improve upon a given interest, and do it again and again. (Lewis, 2014, pp. 169-170)

In an effort to determine why some individuals accomplish more than others of equal abilities, Duckworth, Peterson, Matthews, and Kelly (2007) examined the effects of passion and perseverance for long-term goals (i.e., grit) in a number of achievement contexts, expecting that these dispositional tendencies would be more important in achieving success than intellectual talent. At a general level, gritty people have the capacity to pursue personally meaningful goals over weeks, months, and even years, despite setbacks, failures, boredom, or plateaus in goal progress (Duckworth et al., 2007). In contrast, less gritty individuals may be more likely to give up or change course (i.e., pursue a different superordinate goal or objective) when faced with similar conditions surrounding setbacks, failure, and a lack of progress towards their goals (Duckworth & Gross, 2014).

Theorists postulate that grit is a higher-order construct that comprises two lower-order dimensions, labelled *consistency of interests* and *perseverance of effort* (Duckworth et al., 2007). Duckworth (2016) likened consistency of interests to a compass: “that thing that takes you some time to build, tinker with, and finally get right, and that then guides you on your long and winding road to where, ultimately, you want to be” (p. 60). In other words, consistency of interests describes the sustained ability of an individual to hold their attention (and desire) to achieve goals over long periods of time. Perseverance of effort reflects the tendency of an individual to pursue long-term goals with sustained effort despite obstacles and setbacks (Duckworth & Gross, 2014).

People who have high levels of grit pursue important goals over prolonged periods of time while not only suppressing rival or competing goals, but also while creating new lower-order goals which advance them towards their ultimate superordinate goal if/when a current 'lesser' goal becomes impossible to achieve (Duckworth & Gross, 2014). Research indicates that grit is positively related to many quality-of-life indicators (Jin & Kim, 2017) including positive affect (Hill, Burrow, & Bronk, 2014), hope and optimism (Sheridan, Boman, Mergler, & Furlong, 2015), psychological well-being, satisfaction with life, and harmony in life (Vainio & Daukantaitė, 2016), and negatively correlated with burnout (Salles, Cohen, & Mueller, 2014), anxiety (Sheridan et al., 2015), suicidal ideation and depression (Kleiman, Adams, Kashdan, & Riskind, 2013).

Although grit is generally viewed as an adaptive or functional disposition in the pursuit of achievement, some researchers have suggested that grit may also be associated with a number of less adaptive or less functional psychosocial/behavioral correlates in the achievement-striving process. For example, Crust, Swann, and Allen-Collinson (2016) observed that high-altitude climbers with higher grit levels tended to be more rigid, stubborn, and psychologically inflexible than their less gritty climbing peers, prompting the researchers to posit that people with high levels of grit may at times not know when to quit. Lucas, Gratch, Cheng, and Marsella (2015) found that undergraduate students with higher levels of grit tended to show a greater degree of 'stubborn persistence' than students with lower levels of grit when tasked with solving anagrams (some of which were unsolvable). Moreover, when Lucas et al. (2015) incentivized the anagram-solving task with monetary rewards (i.e., students were promised more money based on their ability to solve more puzzles), grittier students tended to spend more time on difficult anagrams rather than moving on to solve easier anagrams.

Grit has been closely linked with a number of constructs that are often viewed as central to the achievement-striving process including self-control, commitment, mental toughness, and conscientiousness. However, grit differentiates itself from these constructs in that grit primarily measures an individual's ability to persist in obtaining a specific goal over an extended period of time (Duckworth et al., 2007). Although grit and self-control are highly correlated (see Oriol, Miranda, Oyanedel, & Torres, 2017), self-control is an attribute that people use to mediate temptations that may pull their attention away from a current focus, whereas grit is more directed towards the pursuit of a superordinate goal over long periods of time (Duckworth & Gross, 2014). Gritty people can also be considered high in commitment to their goals. While commitment reflects the strength of a person's psychological/emotional connection towards organizations (Eisenberger et al., 2010) or people (Rusbult, Agnew, & Arriaga, 2011), gritty individuals hold a more precise and passionate commitment to their specific long-term goals (Duckworth & Gross, 2014). Mental toughness is also distinct from grit; mental toughness varies within individuals over time and is best conceptualized as a state-like property (Anthony, Gucciardi, & Gordon, 2016; Gucciardi, Hanton, Gordon, Mallett, & Temby, 2015) whereas grit is considered to be a comparatively unwavering stable trait (Duckworth et al., 2007).

Both grit and conscientiousness capture an individual's tendency and ability to stay focused on the pursuit of goals (Duckworth & Quinn, 2009). However, the relationship between conscientiousness and perseverance of effort is considerably stronger than the relationship between conscientiousness and consistency of interests (Credé, Tynan, & Harms, 2017). Additionally, conscientiousness is regarded as a stable present-focused trait (Cobb-Clark & Schurer, 2012) that is closely associated with tidiness and orderliness (McCrae & Costa, 1990), whereas grit is a future-oriented trait that has been found to increase with age and is unrelated to

tidiness and orderliness (Duckworth et al., 2007). Indeed, grit has been shown to predict unique variance associated with success over and above variance explained by IQ (Duckworth et al., 2007), self-control (Duckworth & Gross, 2014), and conscientiousness (Reed, Pritschet, & Cutton, 2013). Thus, it appears that grit plays an important and unique role in achievement settings that goes beyond intelligence, self-control, and conscientiousness.

Two self-report instruments are commonly used by researchers to measure grit: Duckworth et al.'s (2007) original Grit Scale (Grit-O), and Duckworth and Quinn's (2009) short Grit Scale (Grit-S). The Grit-O contains twelve items that are equally distributed between the consistency of interests and perseverance of effort subscales. The instrument was developed and validated in a series of studies conducted by Duckworth et al. (2007) with six independent samples over a three year period. The first study gathered data online from 1,545 adults (aged 25 years and older) to investigate the factor structure and internal reliability of the instrument. Of the original pool of 27 items, 12 items were retained after the researchers considered internal reliability coefficients, item-total correlations, redundancy, simplicity of vocabulary, and exploratory factor analytic (EFA) results. An oblique two-factor solution was retained following the EFA, with each factor/subscale containing six items. The composite 12-item version of the Grit-O had high internal reliability ($\alpha = .85$), as did the two subscales: consistency of interests ($\alpha = .84$) and perseverance of effort ($\alpha = .78$). In addition to providing internal (i.e., structural) validity and reliability evidence to support the use of the Grit-O as a measure of grit, Duckworth et al. reported that when age was controlled, individuals with higher levels of education tended to have higher levels of grit.

In the second study, Duckworth et al. (2007) asked 706 adults aged 25 years and older to complete the Grit-O and a measure of the Big Five personality traits (i.e., openness,

conscientiousness, extraversion, agreeableness, and neuroticism). Participants were also asked to report the frequency of career changes they made during their lifetime. Grit was strongly correlated with conscientiousness (r = .77), however, results of a binary logistic regression analysis "predicting high versus low career change [frequency] from grit, age, and all Big Five traits" (p. 1093) revealed that grit was the only significant predictor of career change frequency, with people higher in grit making fewer career changes during their lifetime.

The third study conducted by Duckworth et al. (2007) examined relationships between grit, academic Grade Point Average (GPA), and Scholastic Assessment Test (SAT) scores among a sample of 139 undergraduate students. Grit was positively correlated with GPA (r = .25, p = .01), and negatively correlated with SAT scores (r = -.20, p = .03). Although Duckworth et al. were surprised by the negative correlation between grit and SAT scores, the authors speculated that "smarter students may be slightly less gritty than their peers…[and that] those who are less bright than their peers [may] compensate by working harder and with more determination" (p. 1093).

In the fourth study, 1,218 freshman cadets who had entered the United States Military Academy (for officer training) at West Point completed the Grit-O and their grit scores were used to predict success (i.e., course completion) in a grueling summer training program. Results of a binary logistic regression analysis revealed that cadets whose grit scores were one standard deviation higher than the sample average were 60% more likely to complete their West Point summer training than their peers. In the fifth study, Duckworth et al. (2007) used a different freshman class at West Point and investigated the degree to which grit explained variance in course retention/attrition rates beyond the variance explained by conscientiousness. Logistic regression results indicated that grit explained variance in summer retention rates beyond the

variance explained by conscientiousness, with grit being positively associated with successful completion (retention) in the course.

The sixth and concluding study conducted by Duckworth et al. (2007) sought to determine whether grit was associated with success and achievement levels of 175 children and youth (*M* age = 13.20 years, *SD* = 1.23) at the 2005 Scripps National Spelling Bee in the U.S.A. After controlling for self-control, verbal IQ, and the amount of time students spent studying, results of an ordinal regression model showed that grit was a significant predictor of advancement into the finals of the competition, and participants with grit scores one standard deviation above the mean were 41% more likely to advance to further rounds in the competition.

Two years after the publication of the series of studies conducted by Duckworth et al. (2007) to develop the Grit-O, Duckworth and Quinn (2009) created an abbreviated version of the original scale that contained only eight items (all of which were contained in the Grit-O): the abbreviated scale was labelled the Grit-S. The Grit-S was validated with similar populations used in the initial scale-construction research for the Grit-O. Confirmatory factor analysis supported the retention of a two-factor model of grit that differentiated between consistency of interests (α = .83) and perseverance of effort (α = .70). Duckworth and Quinn concluded that the Grit-S was a psychometrically valid and reliable measure of passion and perseverance for long-term goals.

Despite the amount of research that has been conducted using the Grit-O and Grit-S, there is a lack of consensus among researchers with respect to how Grit-O and Grit-S scores should be used for inferential purposes (see Credé et al., 2017). Many researchers sum the scores across all items contained within the two instruments to create a single composite grit score (e.g., Ivcevic & Brackett, 2014; Moles, Auerbach, & Petrie, 2017; Mueller, Wolfe, & Syed, 2017; Vainio & Daukantaitė, 2016) whereas others create separate scores for the consistency of

interests and perseverance of effort subscales (e.g., Bowman, Hill, Denson, & Bronkema, 2015; Mete & Toker, 2017; Meyer, Markgraf, & Gnacinski, 2017; Rimfeld, Kovas, Dale, & Plomin, 2016; Tedesqui & Young, 2017; Wolters & Hussain, 2015). On the basis of a meta-analytic study of grit research that included a total of 73 papers, Credé et al. (2017) concluded that "the practice of combining perseverance scores and consistency scores into an overall grit score appears to result in a significant loss in the ability to predict performance" (p. 502).

The perseverance of effort subscale (of the Grit-O and Grit-S) has typically shown itself to be a better predictor of achievement outcomes in comparison to the consistency of interests subscale (see Credé et al., 2017). For example, Abuhàssan and Bates (2015) reported that perseverance of effort among a sample of 494 adults aged 18–70 years was a significant predictor of self-reported long-term achievement—as reflected by an individual's willingness to work hard, enjoy challenging tasks, set high standards and persist when others may give up in both social and work contexts—whereas consistency of interests was not a significant predictor of achievement. Research has also shown that perseverance of effort is a stronger predictor of academic achievement (i.e., GPA) than consistency of interests in a variety of samples including high-school students (e.g., Duckworth & Quinn, 2009) and undergraduate students (e.g., Mete & Toker, 2017).

Duckworth et al. (2007) posited that the consistency of interests subscale represents the sustained direction of an individual's efforts toward a long-term goal. Research appears to support this position in a variety of contexts. For example, consistency of interests was inversely related to thoughts of quitting or switching out of their sport in a sample of 250 athletes (109 female; *M* age = 23.40, *SD* = 10.14) who participated across a wide range of competitive levels (Tedesqui & Young, 2017). In a study of 213 undergraduate and post-baccalaureate university

students conducted by Wolters and Hussain (2015), participants with higher consistency of interests also reported increased use of time- and study-strategies and spent less time procrastinating than students with lower consistency-of-interests scores. Consistency of interests has also been inversely related to the frequency of career changes among adults, whereas perseverance of effort was unrelated to career change frequency (see Duckworth & Quinn, 2009). Given these findings, it seems appropriate to differentiate between the perseverance of effort and consistency of interests subscales in research settings, although it should be acknowledged that the two subscales/dimensions tend to be positively correlated (see Duckworth et al., 2007; Duckworth & Quinn, 2009; Silvia, Eddington, Beaty, Nusbaum, & Kwapil, 2013).

Grit has been studied in a wide variety of achievement contexts. For example, in academic settings, individuals with higher levels of grit have been shown to be more likely (than individuals with lower levels of grit) to graduate from high-school (see Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014), to achieve higher levels of education (see Duckworth & Quinn, 2009), and to experience greater success in scholastic competitions (see Duckworth et al., 2007). In vocational settings, grittier teachers were found to be more effective at managing their first placement at a school and achieve higher performance ratings than their lower-grit colleagues who were in similar situations (see Duckworth, Quinn, & Seligman, 2009). As noted previously, higher levels of grit have been associated with heightened success among army officer cadets at the West Point U.S. Military Academy in the context of succeeding in rigorous summer training programs (see Duckworth et al., 2007), and research in the domain of personal relationships has shown that grittier men tend to remain married for longer periods of time than less gritty men (Eskreis-Winkler et al., 2014).

In comparison to other achievement contexts—and particularly education—relatively few

studies have examined the construct of grit in sport. Nevertheless, research in competitive sport has found that grit is positively correlated with (a) self-restraint and impulse control in elite Norwegian soccer players (Toering & Jordet, 2015), (b) resilience, hardiness, and sport engagement in competitive wheelchair basketball athletes (see Martin, Byrd, Watts, & Dent, 2015), and (c) experiences of pride when success is attributed to one's effort in university student-athletes and long-distance runners (Gilchrist, Fong, Herbison, & Sabiston, 2018). Despite these findings, Meyer et al. (2017) recently argued that sport psychology researchers and practitioners should be wary of "using terms (or labels) like grit because little… evidence exists to support the significance of the construct in the sport domain" (p. 363). In light of the position expressed by Meyer et al., it would appear that there is a need for more research examining the role of grit as it relates to the achievement-striving process in competitive sport.

Although grit has been examined in a variety of achievement domains, it is important to note that no research has compared individuals' grit levels across domains. In other words, no researchers have attempted to determine whether people have similar levels of grit in different achievement contexts. This is an important gap in the literature because such evidence would be valuable in determining whether grit is best conceptualized and measured as a global/generic (i.e., domain-general) construct or as a domain-specific construct. The lack of research in this area is surprising given that numerous researchers (e.g., Eskreis-Winkler et al., 2014; Griffin, McDermott, McHugh, Fitzmaurice, & Weiss, 2016; Sheehan, 2014) have questioned whether grit should be treated as a domain-general construct or as a domain-specific construct. Indeed, Duckworth and Quinn (2009) identified this issue almost a decade ago when they wrote:

> an important conceptual question that should be addressed in further research concerns the domain specificity of grit… The implicit assumption [in the research community] is

> that the tendency to pursue long-term goals with passion and perseverance is relatively domain general, but of course, it is possible that an individual shows tremendous grit in her or his professional life but none at all in her or his personal relationships. Similarly, it may be that an individual sees oneself as gritty with respect to a serious hobby but not with respect to one's career… Our intuition is that respondents [when indicating their grit levels on existing self-report instruments] integrate behavior over domains, but we cannot be sure. Future studies are needed to explore the domain-specific versus domain-general aspects of grit. (p. 173)

Duckworth and Quinn's (2009) comments seem particularly important given that the Grit-O and the Grit-S both conceptualize and measure grit as a domain-general construct. Determining whether grit is best conceptualized as a domain-general or domain-specific construct will not only enhance the research community's theoretical understanding of grit, but evidence supporting a domain-specific conceptualization of grit may present opportunities for the development of domain-specific measures that could shed more light upon the role that grit plays in different achievement settings (see Meyer et al., 2017).

To the best of the researcher's knowledge, only one study in the peer reviewed literature has attempted to address the domain-general versus domain-specificity question surrounding the conceptualization and measurement of grit. Schmidt, Fleckenstein, Retelsdorf, Eskreis-Winkler and Möller (2017) developed a German-language version of Duckworth and Quinn's (2009) Grit-S—named, the Beharrlichkeit and Beständiges Interesse-8 (i.e., BISS-8). Schmidt et al. asked 271 (149 female) students from a German high-school (*M* age = 13.41 years, *SD* = 1.22) to complete two versions of the BISS-8—a global (i.e., domain-general) version that matched the original conceptualization of grit within the Grit-S—and a version that situated participants' grit

responses in the context of school/academe. Results of a multiple regression analysis revealed that the school version of the BISS-8 was a significant predictor of student GPA ($\beta = .33$, $p < .001$), whereas the domain-general version of the BISS-8 was not a significant predictor of GPA ($\beta = .19$, $p = .84$). Given that the domain-specific (i.e., school) version of the BISS-8 was a superior predictor of academic GPA than the domain-general version of the BISS-8, Schmidt et al. concluded that their results provided evidence supporting the domain-specific conceptualization/measurement of grit in an academic context.

Unfortunately, Schmidt et al. (2017) did not report the degree to which the absolute grit levels of the participants in their study varied as a function of the context in which grit responses were considered. Therefore, the degree to which people have similar (or different) grit levels across achievement contexts remains largely undetermined. Consequently, the first purpose of this thesis was to examine the degree to which grit levels vary (or remain constant) as a function of the situational context that people consider when providing their grit responses. To accomplish this goal, the current study sought to ask intercollegiate (varsity) student-athletes to report their grit levels in three contexts—namely, sport, school and 'life in general'—where the latter context reflected a domain-general conceptualization of grit. This approach closely follows protocols employed by Dunn, Gotwals, and Causgrove Dunn (2005) who investigated a similar research question as it related to the domain-specificity of perfectionism (i.e., another achievement-related personality disposition).

Dunn et al. (2005) asked a sample of 241 intercollegiate student-athletes (108 female) from a variety of team sports to indicate their levels of perfectionism in the context of competitive sport, school/academe, and life in general. Results of repeated measures MANOVAs revealed that, on average, both male and female student-athletes had significantly higher levels

of perfectionism in sport than in school and life in general ($ps < .001$). Dunn et al. (2005) concluded that their results provided evidence supporting the domain-specific conceptualization of perfectionism.

Adopting similar procedures employed by Dunn et al. (2005), the current study sought to determine if intercollegiate student-athletes would report different levels of grit in sport, school, and life in general. Evidence supporting the domain-specific conceptualization of grit would be obtained if grit levels differed significantly across the three contexts that were presented to respondents. Evidence supporting the domain-general conceptualization of grit would be obtained if grit levels did not differ across the three contexts.

The second purpose of this study was to further examine the domain-specific versus domain-general conceptualization of grit by exploring the degree to which domain-specific measures of grit could explain variance in domain-matched criterion variables that was not explained by a domain-general measure of grit. If grit is best conceptualized as a domain-specific construct, then a domain-specific measure of grit would be expected to explain variance in a domain-congruent criterion variable over and above the variance explained by a domain-general measure. If a domain-specific measure could not explain variance in a domain-matched criterion variable beyond the variance explained by a domain-general measure, support for a domain-general conceptualization of grit would be obtained. This approach seeks to provide incremental predictive validity evidence (see Garb, 1984) that either supports or refutes the appropriateness of treating grit as a domain-specific construct. Comparing the predictive or explanatory power of domain-general instruments against domain-specific instruments is a well-established approach that has been used in the construct-validation process (Messick, 1989) surrounding instrument development in the extant literature (e.g., Dunn, Craft, Causgrove Dunn, & Gotwals, 2011;

Hunthausen, Truxillo, Bauer, & Hammer, 2003; Martens & Simon, 1976; Smith, Smoll, & Schutz, 1990). The domain-congruent criterion variables that were selected in the current study were GPA (for the school/academic context) and perfectionism (for the competitive sport context).

Building upon the work of Schmidt et al. (2017), GPA was used in the current study as the domain-matched criterion variable in the school/academic setting because research has frequently shown that grit is a significant predictor of GPA in academic/educational contexts (see Credé et al., 2017). For example, grit has been a significant positive predictor of GPA in Ivy League and state college students (Duckworth et al., 2007), first-year university students attending South African colleges (Mason, 2018), African-American males attending a university with a predominantly White student population (Strayhorn, 2014), student pharmacists (Pate et al., 2017), and doctoral students (Cross, 2014). Evidence supporting a domain-specific conceptualization of grit would be obtained if a school/academic version of the Grit Scale accounted for a significant portion of unique variance in GPA beyond the variance explained by a domain-general version of the Grit Scale. In light of the recent findings reported by Schmidt et al. (2017)—where a school/academic version of the BISS-8 was a superior predictor of GPA in German high-school students than a domain-general version of the BISS-8—it was tentatively hypothesized that a school/academic version of Duckworth et al.'s Grit Scale would account for a significant portion of variance in GPA over and above the variance explained by a domain-general version of the instrument.

Domain-specific perfectionism was selected as the domain-congruent criterion variable in the context of sport because certain elements (or facets) of perfectionism are believed to help athletes attain high achievement/performance standards in sport (see Gould, Dieffenbach, &

Moffett, 2002; Stoeber, 2011; Stoeber, Uphill, & Hotham, 2009) in the same way that grit may facilitate the accomplishment of high achievement standards in educational settings (cf. Duckworth et al., 2007). Loosely defined, perfectionism in sport is a domain-specific multidimensional achievement motivation disposition (e.g., Dunn, Causgrove Dunn, & McDonald, 2012; Dunn, Causgrove Dunn, & Syrotuik, 2002; Dunn et al., 2005; McArdle, 2010) that reflects the degree to which athletes set and strive for the attainment of very high standards of performance in sport—labelled *perfectionistic strivings*—and the degree to which athletes are concerned about failing to reach these high standards—labelled *perfectionistic concerns* (see Gotwals, Stoeber, Dunn, & Stoll, 2012).

Perfectionistic strivings reflect the degree to which people set and strive for the attainment of very high (flawless) performance standards (see Stoeber & Otto, 2006). Perfectionistic strivings in sport have been linked with adaptive outcomes—including heightened athletic performance (see Gould et al., 2002; Stoeber, Uphill, et al., 2009)—particularly when the overlap with perfectionistic concerns is controlled (see Gotwals et al., 2012; Jowett, Mallinson, & Hill, 2016). In contrast, high perfectionistic concerns are almost always associated with maladaptive, unhealthy, or dysfunctional correlates/outcomes in achievement settings (see Gotwals et al., 2012; Jowett et al., 2016; Stoeber, in press). At their core, perfectionistic concerns reflect individuals' "concerns over making mistakes, fear of negative evaluation by others, feelings of discrepancy between one's expectations and performance, and negative reactions to imperfection" (Stoeber, 2011, p. 129). Although no previous research has examined links between grit and perfectionism, there appears to be a strong theoretical case to be made that grit would be positively correlated with perfectionistic strivings and negatively correlated with perfectionistic concerns in sport.

Stoeber (2011) proposed that perfectionistic strivings give athletes a motivational "'boost' to do their best, make an additional effort, and achieve the best possible results" (p. 140). Building upon this idea, Lizmore, Dunn, and Causgrove Dunn (2017) recently reported that perfectionistic strivings were positively correlated with self-compassion and optimism in a sample of 239 (99 female) intercollegiate team-sport varsity athletes (*M* age = 20.5 years), and negatively correlated with pessimism. Given that optimism reflects an orientation to expect positive future outcomes (Carver & Scheier, 2014), athletes are likely to set increasingly higher performance standards (and therefore have higher perfectionistic strivings) if they are confident they will be able to achieve these goals (see Dunn et al., 2012). It therefore seems reasonable to speculate that perfectionistic strivings and grit may have similar motivational functions for athletes in sport that enhance their ability/desire to stay engaged in the pursuit of challenging and personally meaningful performance goals over long periods of time, especially when progress towards the accomplishment of these performance goals is blocked (Lizmore et al., 2017).

Theorists propose that grit reflects "the tenacious pursuit of a dominant superordinate goal despite setbacks" (Duckworth & Gross, 2014, p. 319) and facilitates the ability of people to work "strenuously towards challenges, maintaining effort and interest over years despite failures, adversity, and plateaus in progress" (Duckworth et al., 2007, pp. 1087-1088). As such, grit is often conceptualized as an adaptive/functional disposition that drives people to persist in achievement settings, especially in circumstances where failure, setbacks, and adversity are regularly encountered. The tendency to persist, endure, or persevere has been positively associated with facets of perfectionistic strivings (see Stoeber & Otto, 2006; Stumpf & Parker, 2000), and may be especially important in the context of competitive sport where personal failure and adversity are commonplace (see Anshel, 2016). It was therefore hypothesized that

both the consistency-of-interests and perseverance-of-effort subscales of grit would be positively correlated with perfectionistic strivings in sport.

In competitive sport, higher perfectionistic concerns have been associated with heightened burnout, performance-avoidance goals, dejection, anger, anxiety, self-criticism, avoidance coping, and amotivation (for a recent review see Jowett et al., 2016), as well as reduced self-compassion, reduced optimism, heightened pessimism, and heightened rumination following personal adversity in sport (see Lizmore et al., 2017). As such, high perfectionistic concerns are thought to provide athletes with few (if any) affective, cognitive, motivational, or behavioral benefits in sport (Flett & Hewitt, 2016; Jowett et al., 2016), and may even motivate athletes to avoid demonstrating incompetence to such an extent (see Kaye, Conroy, & Fifer, 2008) that they give up or dropout of sport, especially in the face of adversity (see Jowett et al., 2016). In contrast, higher levels of grit in athletes have been associated with heightened engagement in both competitive sport (Martin et al., 2015) and training activities (Larkin, O'Connor, & Williams, 2016) that are deemed necessary for the accomplishment of athletes' performance goals. Based on the aforementioned theoretical and empirical evidence, it was anticipated that both the consistency-of-interests and perseverance-of-effort subscales of grit would be negatively correlated with perfectionistic concerns in sport.

Although this is the first study to explore relationships between grit and perfectionism (i.e., perfectionistic strivings and perfectionistic concerns) in sport, it is important to emphasize that the overarching purpose of this study was to determine whether grit is best conceptualized and measured as a domain-general or domain-specific construct. In the context of this research, evidence supporting a domain-specific conceptualization of grit would be obtained if a sport-version of Duckworth et al.'s (2007) Grit Scale accounted for a significant portion of variance in

perfectionistic strivings and/or perfectionistic concerns in sport beyond the variance explained by a domain-general version of the Grit Scale.

Chapter 2: Method

Participants

A total of 251 (102 female) intercollegiate (varsity) student-athletes (*M* age = 20.34 years, *SD* = 2.0) from a large western Canadian university participated in the study. Student-athletes were sampled from the sports of basketball (14 female), Canadian football (84 male), ice hockey (25 female, 26 male), rugby (29 female), soccer (23 female, 24 male), and volleyball (11 female, 15 male). Participants reported an average of 2.39 years (*SD* = 1.32) playing experience at the intercollegiate (varsity) level, and 11.17 years (*SD* = 4.52) of competitive experience in their respective sports. All participants were studying at the undergraduate level with the exception of two individuals who were studying for graduate degrees. Participants were enrolled in degree programs across 13 different faculties at the university, with the majority being enrolled in the faculties of Kinesiology, Sport, and Recreation (26.3%), Arts (13.5%), Business (11.6%), Science (10%) and Education (8.8%). Expectations for competitive success at the university were high, with five of the nine teams having won at least one national championship in the preceding five years. To maintain academic eligibility for a varsity sport team, student-athletes were required to maintain a minimum GPA of 2.0 (on a 4-point scale).

Measures

A demographic questionnaire (see Appendix A) was used to obtain information about participants' age, gender, faculty enrollment, GPA, sport, and competitive experiences. Participants in their first university semester (*n* = 57) self-reported their high-school GPA (expressed as a percentage); all other participants self-reported their university GPA (expressed on a 4-point scale).

Grit. Two measures of grit are commonly used by researchers in the extant literature:

Duckworth et al.'s (2007) original Grit-O, and Duckworth and Quinn's (2009) shortened Grit-S. The Grit-O contains twelve items, whereas the Grit-S contains only eight items (all of which are contained in the Grit-O). Extensive psychometric evidence supporting the validity and reliability of the two versions of the scale has been reported in the literature (e.g., Duckworth et al., 2007; Duckworth & Quinn, 2009; Mason, 2018; Von Culin, Tsukayama, & Duckworth, 2014). Both the original scale (see Rhodes, May, Andrade, & Kavanagh, 2018; Tedesqui & Young, 2018) and the short-version of the scale (see Larkin et al., 2016; Moles et al., 2017) have been used to measure grit in athletes, however, in keeping with the position of Rhodes et al. (2018), the 12-item Grit-O was selected for use in this study because it contains items (deleted from the Grit-S) that appear to have strong relevance to student-athletes in both sport and academic contexts (e.g., "I have overcome setbacks to conquer an important challenge").

Given that the purpose of this study was to assess grit in different achievement contexts, three versions of the Grit-O were employed: a global (domain-general) version, a sport version, and a school/academic version. The domain-general version of the scale—henceforth labelled, *Global Grit* (see Appendix B)—conceptualizes and measures grit as a domain-general personality trait and provides no specific situational frame of reference for respondents to consider when evaluating their grit responses. The 12 items are distributed equally across two subscales that measure *consistency of interests* (e.g., "I become interested in new pursuits every few months") and *perseverance of effort* (e.g., "Setbacks don't discourage me"). Using a 7-point Likert-type scale (1 = *not at all like me*, 7 = *exactly like me*), respondents rate the degree to which each item describes them "*in every-day life.*" The six consistency-of-interests items are reverse scored, whereupon higher composite scores on each of the two subscales reflect higher levels of grit.

Initial instructions on the sport version of the scale—henceforth labelled, *Sport Grit* (see Appendix C)—asked respondents to consider how each item best described them "*as an athlete in sport*", and the school version of the scale—henceforth labelled, *School Grit* (see Appendix D)—asked respondents to consider how each item best described them in their "*academic pursuits.*" To further enhance the domain-specificity of each instrument, all items in the sport scale were preceded by the phrase, "*As an athlete in sport…*", and all items in the school scale were preceded by the phrase, "*In my academic pursuits…*"

To improve the content relevance and face validity of items in the sport and school versions of the scale, the word "project" (that is contained in three items from the consistency-of-interests subscale of the Grit-O) was replaced with the word "goal." It was felt that the word "project" would likely not be part of the everyday language that athletes use to describe their actions and pursuits in sport, and "projects" in academic (university) settings are likely to describe short-term course assignments rather than longer term educational goals. To illustrate the changes that were incorporated into the two domain-specific version of the scales, the item "*I have difficulty maintaining my focus on projects that take more than a few months to complete*" from the Grit-O (that assess grit as a global construct) was modified to read, "*As an athlete in sport, I have difficulty maintaining my focus on goals that take more than a few months to complete*" in the Sport Grit Scale, and to read, "*In my academic pursuits, I have difficulty maintaining my focus on goals that take more than a few months to complete*" in the School Grit Scale.

Although grit is conceptualized and measured as a higher-order construct that is comprised of two sub-dimensions (i.e., consistency of interests and perseverance of effort), there is a lack of consensus among researchers with respect to scoring the grit scales (see Credé et al.,

2017). Many researchers sum the scores across all items from the two subscales to create a single composite grit score (e.g., Ivcevic & Brackett, 2014; Moles et al., 2017; Mueller et al., 2017; Vainio & Daukantaitė, 2016) whereas others treat the two subscales separately (e.g., Bowman et al., 2015; Mete & Toker, 2017; Meyer et al., 2017; Rimfeld et al., 2016; Tedesqui & Young, 2017; Wolters & Hussain, 2015). In the current study, it was the intention of the researcher to treat scores for the consistency-of-interests and perseverance-of-effort subscales within each version of the instrument separately because Credé et al. (2017) recently concluded—on the basis of results from a meta-analysis of grit research—that "the practice of combining perseverance scores and consistency scores into an overall grit score appears to result in a significant loss in the ability to predict performance" (p. 11).

Perfectionism. In accordance with recent recommendations provided by Stoeber and Madigan (2016), perfectionism in sport was measured using select subscales from the Sport-Multidimensional Perfectionism Scale-2 (Sport-MPS-2: Gotwals & Dunn, 2009) and the Multidimensional Perfectionism Scale in Sport (MIPS: Stoeber, Otto, & Stoll, 2006). *Perfectionistic strivings* were measured by the seven items contained within the Personal Standards (PS) subscale of the Sport-MPS-2 (e.g., "If I do not set the highest standards for myself in my sport, I am likely to end up a second-rate player") and five items from the Striving for Perfection (SP) subscale of the MIPS (e.g., "In sport, I strive to be as perfect as possible"). *Perfectionistic concerns* were measured by the eight items contained within the Concern Over Mistakes (COM) subscale of the Sport-MPS-2 (e.g., "If I play well but only make one obvious mistake in the entire game, I still feel disappointed with my performance") and the five items contained within the Negative Reactions to Imperfection (NRI) subscale of the MIPS (e.g., "In sport, I become furious if I make mistakes"). The full set of 25 items contained within the

perfectionism measure is shown in Appendix E.

Participants responded to items on a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*), with higher composite subscale scores reflecting higher levels of perfectionistic strivings and/or perfectionistic concerns. Validity and reliability evidence supporting the use of the current set of items to measure perfectionistic strivings and perfectionistic concerns in sport has been reported in the literature (e.g., Lizmore et al., 2017; Rasquinha, Dunn, & Causgrove Dunn, 2014; Stoeber, Stoll, Pescheck, & Otto, 2008; Stoeber, Stoll, Salmi, & Tiikkaja, 2009).

Procedures

Approval to conduct the study was obtained from the institutional Human Research Ethics Board, after which approval was also obtained from the university Athletic Director. Head coaches of varsity teams were then contacted (by email and phone calls) to ask for permission to approach their athletes and to set up convenient meeting times when data could be collected. Arrangements were made to meet with each team in a classroom setting near the teams' respective training facilities during the competitive season, and never within a 24 h period before or after competition. A letter describing the general intent of the study was presented to participants (see Appendix F). A brief verbal overview of the study was also provided by the researcher prior to the start of data collection. Participation was voluntary, and all student-athletes were treated in accordance with the ethical guidelines for human research set forth by the American Psychological Association.

Participants completed five paper-and-pencil self-report questionnaires/instruments. The demographic questionnaire was always administered first, followed by the Global Grit scale. The three remaining instruments (that measured sport grit, school grit, and perfectionism) were then presented in random orders within each test package in an effort to minimize any potential

presentation order effects. No members of the coaching staff or support staff were present in the classrooms when student-athletes completed their test packages. Participants took approximately 20 minutes to complete the entire package. All test packages were completed from October 2017 to January 2018.

Chapter 3: Results

Preliminary Data Analyses

A total of 16 missing data points (out of a possible 15,311 responses) were identified among participant responses across the three grit scales and the perfectionism measure. All missing data points were replaced with intra-individual mean-item scores that were computed from the average of the scores on the remaining items within the relevant subscale provided by the individual (see Graham, Cumsille, & Elek-Fisk, 2003).

Given the changes that were made to the instruction-sets and items contained within the three grit scales, and considering current debates regarding the appropriateness of combining consistency-of-interests and perseverance-of-effort scores into a single composite grit score or treating the subscales as separate facets of grit (see Credé et al., 2017), the latent structure of all three grit scales was examined before commencing with any other statistical analyses. Maximum likelihood confirmatory factor analyses (using LISREL 8.72: Jöreskog & Sörbom, 1996) were conducted upon the inter-item covariance matrices for each scale. Preliminary data screening (using Box's *M* tests) indicated that the covariance matrices for male and female participants on all three scales were homogeneous (all *p*s > .001) making it permissible to combine male and female responses into a single data set for each grit scale.

Two *a priori* models were tested: a unidimensional model in which all 12 items loaded on a single factor, and a 2-factor model in which the six consistency-of-interests items loaded on one factor and the six perseverance-of-effort items loaded on another factor. Model fit was assessed using criteria specified by Hu and Bentler (1999) whereby an adequate fitting model is obtained when the following combination of fit-index criteria is met: a non-significant χ^2 test, a Root Mean Square Error of Approximation (RMSEA) ≤ .06, a Comparative Fit Index (CFI) ≥.95,

and a Standardized Root Mean Square Residual (SRMR) ≤.08. None of the fit indices for any of the models tested across the three scales met these combined criteria (see Table 1), although it is worth noting that χ^2 difference tests for nested models (see Tabachnick & Fidell, 1996, p. 783) comparing the 1- and 2-factor solutions for each scale were all statistically significant—Global Grit (χ^2 [1] $_{\text{difference}}$ = 274.75, $p < .001$), Sport Grit (χ^2 [1] $_{\text{difference}}$ = 556.53, $p < .001$), School Grit (χ^2 [1] $_{\text{difference}}$ = 339.81, $p < .001$)— indicating that the 2-factor models provided a significant improvement in model fit over the 1-factor models. Rather than searching for better fitting solutions using modification indices (which changes the analysis from a confirmatory approach to an exploratory approach as well as increasing the risk of capitalizing on chance to find good fitting models: see Thompson, 2004), the data for each scale were subsequently reanalyzed using exploratory factor analyses (cf. Lizmore et al., 2017).

Table 1

Goodness-of-Fit Indices for Hypothesized (i.e., Target) Models for the 12-Item Global, Sport, and School Grit Scales Following Confirmatory Factor Analyses

Model	χ^2 (*df*)	RMSEA	SRMR	CFI
Global Grit 1-factor	508.62 (54)***	.24	.14	.79
Global Grit 2-factor	233.87 (53)***	.12	.10	.93
Sport Grit 1-factor	750.25 (54)***	.23	.12	.84
Sport Grit 2-factor	193.72 (53)***	.10	.08	.95
School Grit 1-factor	510.31 (54)***	.18	.12	.81
School Grit 2-factor	170.05 (53)***	.09	.07	.93

Note. RMSEA = root mean square error of approximation; SRMR = standardized root mean squared residual; CFI = comparative fit index.

***$p < .001$.

The inter-item correlation matrices for the three grit scales were examined separately using Principal Axis factor analyses followed by oblique (direct oblimin [delta = 0]) rotations). As recommended by Velicer, Eaton, and Fava (2000), the number of factors extracted was based upon the combination of scree-test (Cattell, 1978) and parallel-analysis results (Lautenschlager, 1989). The scree plots for each version of the grit scale (see Figures 1, 2, and 3) all supported the retention of two factors (as evidenced by the fact that the visible break in each scree plot came between the second and third eigenvalues). Similarly, the parallel analysis results for all three scales (see Table 2) also supported the retention of two factors for each instrument (as evidenced by the fact that the size of the third eigenvalue generated by the parallel analysis with random data was larger than the eigenvalue associated with the third factor produced from the actual data for the three scales).

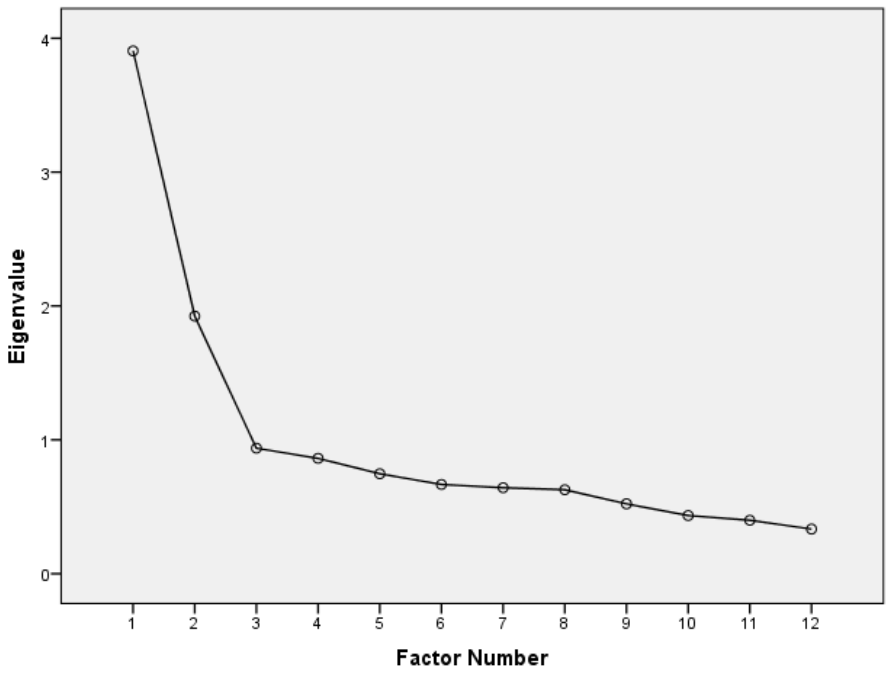

Figure 1. *Scree plot resulting from the Principal Axis factor analysis conducted upon the 12-item Global Grit Scale*.

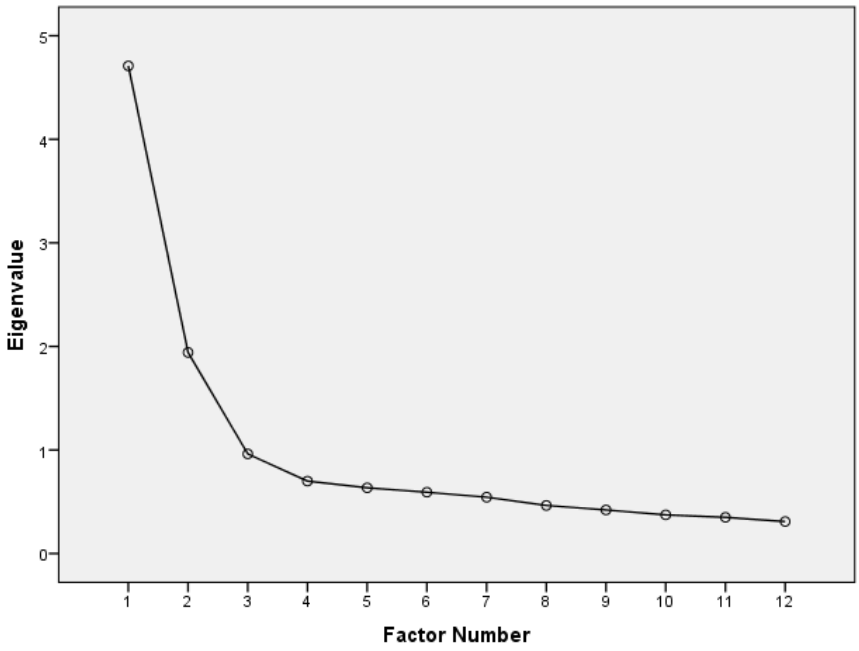

Figure 2. *Scree plot resulting from the Principal Axis factor analysis conducted upon the 12-item Sport Grit Scale*.

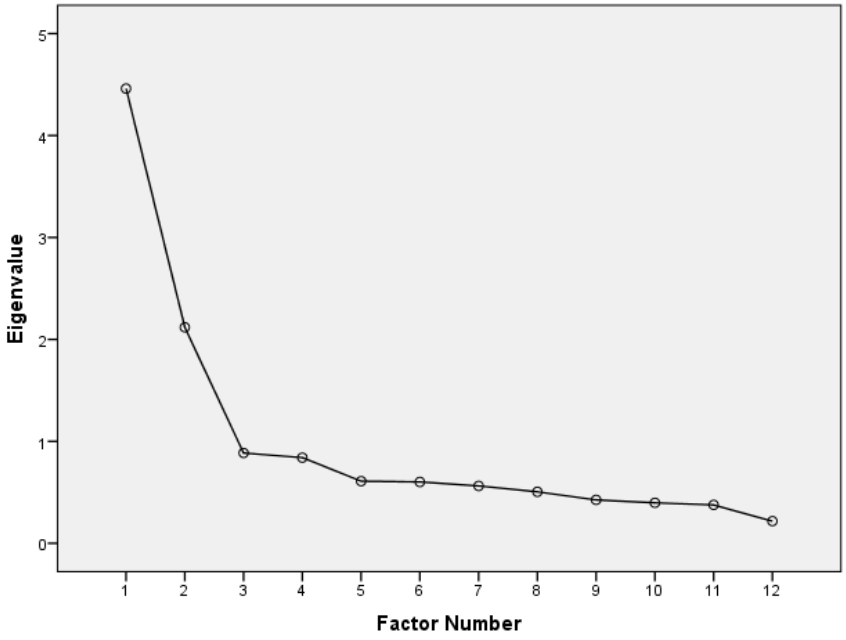

Figure 3. *Scree plot resulting from the Principal Axis factor analysis conducted upon the 12-item School Grit Scale*.

Table 2

Eigenvalues for the First Three Factors Extracted by Principal Axis Factor Analyses for Each Measure of Grit and Corresponding Eigenvalues Produced by Parallel Analysis

Eigenvalue Number	Global Grit	Sport Grit	School Grit	Parallel Analysis
λ_1	3.91	4.71	4.46	1.37
λ_2	1.92	1.94	2.12	1.27
λ_3	0.94	0.96	0.89	1.20

Following rotation, all items (with the exception of Item 11) in each solution (see Table 3) demonstrated excellent simple structure (i.e., a pattern coefficient ≥ .30 on only one factor). Item 11 was deemed to be a poor item because it cross-loaded on both factors in each solution (i.e., it had a pattern coefficient ≥ .30 on both factors). Items that were designed to measure consistency of interests (i.e., items 1, 3, 5, 7, and 9) loaded on Factor 1, and items that were designed to measure perseverance of effort (items, 2, 4, 6, 8, 10, and 12) loaded on Factor 2. Inter-factor correlations (*r*) were moderate in size: Global Grit = .31, Sport Grit = .36, School Grit = .29. Given that Item 11 failed to demonstrate simple structure in any of the three solutions, it was removed from all versions of the scale.[1]

[1] Appendix G contains the pattern coefficients for each scale following principal axis analyses (with direct oblimin rotations) with Item 11 removed from the data set.

Table 3

Pattern Coefficients for Principal Axis Factor Analyses with Direct Oblimin Rotations of Global, Sport, and School Grit Scales

		Global		Sport [a]		School [b]	
	Item descriptions	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*
1.	I often set a goal but later choose to pursue a different one.	.18	**.40**	.10	**.68**	.14	**.63**
2.	I have achieved a goal that took years of work.	**.49**	.02	**.69**	-.01	**.65**	-.12
3.	New ideas and projects/goals sometimes distract me from previous ones.	-.02	**.61**	.02	**.78**	.07	**.74**
4.	I have overcome setbacks to conquer an important challenge.	**.61**	-.04	**.72**	-.04	**.55**	-.09
5.	I become interested in new pursuits/goals every few months.	-.17	**.77**	-.21	**.70**	-.22	**.73**
6.	I finish whatever I begin.	**.57**	.19	**.64**	.10	**.51**	.27
7.	My interests change from year to year.	-.06	**.64**	.10	**.67**	-.06	**.67**
8.	Setbacks don't discourage me.	**.39**	-.05	**.35**	-.02	**.32**	.15
9.	I have been obsessed with a certain idea or project/goal for a short time but later lost interest.	.11	**.63**	.20	**.59**	.16	**.61**
10.	I am a hard worker.	**.72**	-.05	**.73**	-.04	**.86**	.02
11.	I have difficulty maintaining my focus on projects/goals that take more than a few months to complete.	**.30**	**.50**	**.41**	**.39**	**.41**	**.47**
12.	I am diligent.	**.73**	.10	**.72**	.09	**.81**	.05

Note. Pattern coefficients >.30 are in boldface.

[a] Items were preceded by the phrase, "*As an athlete in sport…*" [b] Items were preceded by the phrase, "*In my academic studies…*"

As shown in Table 4, the internal consistency (Cronbach's α) for the 5-item consistency-of-interests subscale and 6-item perseverance-of-effort subscale was acceptable across all three grit scales (αs ≥ .74), as was the internal consistency for the perfectionistic strivings (α = .86) and perfectionistic concerns (α = .89) subscales of the perfectionism measure. Descriptive statistics (i.e., means, standard deviations, and bivariate correlations) for the grit subscales, the perfectionism subscales, and GPA are also presented in Table 4.

Prior to conducting any subsequent statistical analyses, data were screened for the presence of univariate and multivariate outliers. To screen for univariate outliers, standardized z-scores were computed for each variable (i.e., six grit subscales, two perfectionism subscales, and GPA). Following the recommendations of Tabachnick and Fidell (1996), any person with a *z*-score > |3.29| on a variable would be considered a univariate outlier. No *z*-scores exceeded this criterion value across any variables. To screen for multivariate outliers, Mahalanobis distances were computed for all participants based upon their scores across the nine variables (i.e., six grit subscales, two perfectionism subscales, and GPA). Following procedures outlined by Tabachnick and Fidell (pp. 67-68, p. 94), an individual case would be considered a multivariate outlier if the corresponding Mahalanobis distance exceeded a χ^2 (9) value of 27.877 ($p < .001$). All Mahalonobis distances were ≤ 24.005 therefore no multivariate outliers were identified in the data set.

Table 4

Means, Standard Deviations, Bivariate Correlations (r), and Internal Consistency Values (α) for each Variable

	Global Grit [a]		Sport Grit [a]		School Grit [a]		Perfectionism [b]		Grade Point Average	
Variables	CI	PE	CI	PE	CI	PE	Strivings	Concerns	Univ.[c]	HSch.[d]
Global CI	α = .75	.30***	.57***	.21**	.53***	.17**	.14*	-.09	.08	.12
Global PE		α = .74	.27***	.72***	.08	.54***	.32***	-.18**	.21**	.24
Sport CI			α = .82	.36***	.43***	.15*	.11	-.16*	.10	.01
Sport PE				α = .79	.03	.40***	.32***	-.18**	.11	.09
School CI					α = .81	.32***	.04	-.05	.21	.05
School PE						α = .79	.10	-.07	.52***	.42**
Strivings							α = .86	.45***	-.03	.15
Concerns								α = .89	-.01	.19
Mean	4.45	5.42	5.07	5.71	4.57	4.92	3.79	2.93	2.95	84.20
(*SD*)	(0.98)	(0.80)	(1.03)	(0.82)	(1.13)	(1.03)	(0.58)	(0.74)	(0.57)	(6.33)

Note. 251 participants responded to the grit and perfectionism measures; 190 participants reported a university GPA; 57 participants reported a high-school GPA. Corresponding statistics for each variable are based on these different sample sizes. Bivariate correlations (*r*) are contained in the upper triangular matrix. Internal consistency coefficients (α) are contained in the main diagonal. Abbreviations: CI = Consistency of interests; PE = Perseverance of effort; Univ. = University; HSch = High-school.

[a] Measured of a 7-point scale. [b] Measured on a 5-point scale. [c] Measured on a 4-point scale. [d] Measured as a percentage.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Differences in Domain-Specific Levels of Grit

There is some research evidence indicating that gender may influence grit responses (see Christensen & Knezek, 2014). Therefore, prior to examining differences in grit levels across the three contexts (i.e., sport, school, and 'life in general'), a MANOVA was conducted to check for gender differences on each of the six subscales. Gender (male vs female) was entered as the independent variable, and the six grit subscales (i.e., consistency of interests in sport [Sport-CI], perseverance of effort in sport [Sport-PE], consistency of interests in school [School-CI], perseverance of effort in school [School-PE], domain-general consistency of interests [Global-CI], and domain-general perseverance of effort [Global-PE]) were entered as the dependent variables. A statistically significant multivariate test statistic was obtained: Wilks' $\Lambda = .939$, $F(6, 244) = 2.64$, $p = .02$). However, follow up univariate *F*-tests on each subscale revealed only one significant difference for School-PE (F [1, 249] = 4.30, $p = .04$, partial $\eta^2 = .01$), with female participants reporting higher perseverance of effort in school ($M = 5.09$, $SD = 0.98$) than male participants ($M = 4.81$, $SD = 1.05$). Given that only one gender difference was found among the six grit subscales, and the corresponding effect size was very small (i.e., partial $\eta^2 = .01$), the data provided by male and female participants were combined into a single data set for all further analyses.

Following a similar analytical protocol employed by Dunn et al. (2005), a repeated-measures multivariate analysis of variance (RM-MANOVA) was conducted to determine if grit levels varied as a function of the situational contexts that were represented in each of the three grit scales. The three grit scales (i.e., Global Grit, Sport Grit, and School Grit) were entered as the repeated measures (i.e., within-subjects) factor, and the consistency-of-interests and perseverance-of-effort subscales were entered as the dependent variables. A significant within-

subjects multivariate test statistic was obtained: Wilks $\Lambda = .52$, $F\ (4, 247) = 56.74$, $p < .001$, partial $\eta^2 = .48$. Follow up univariate *F*-tests for both dependent variables were also significant: consistency of interests ($F\ [2, 500] = 50.24$, $p < .001$, partial $\eta^2 = .17$) and perseverance of effort ($F\ [2, 500] = 104.60$, $p < .001$, partial $\eta^2 = .30$). Mean contrasts (dependent *t*-tests) with Bonferroni corrections were then conducted (see Table 5) to determine if/where domain-specific differences in grit existed for each dependent variable (cf. Dunn et al., 2005). On average, Sport-CI was significantly higher than School-CI and Global-CI; Sport-PE was significantly higher than School-PE and Global-PE; and Global-PE was significantly higher than School-PE.

Corresponding effect sizes (Cohen's [1977] d_z for dependent means) for all significant differences were moderate (i.e., ES = .44) or large (i.e., ES = .82) in magnitude (see Table 5). These results indicate that self-reported grit levels appear to differ as a function of the situational context within which participants' grit responses are considered.

Table 5

Post-Hoc Mean Comparisons (Dependent t-tests) Between Global, Sport, and School Grit Scales

Grit subscale comparisons	$M_1 - M_2 = M_{difference}$	t (df = 250)	Effect Size [a]
Consistency of interests (CI)			
Global CI – Sport CI	4.45 – 5.07 = -0.62	-10.56***	0.67
Global CI – School CI	4.45 – 4.57 = -0.12	-1.76	0.11
Sport CI – School CI	5.07 – 4.57 = 0.50	6.96**	0.44
Perseverance of effort (PE)			
Global PE – Sport PE	5.42 – 5.71 = -0.29	-7.53***	0.47
Global PE – School PE	5.42 – 4.92 = 0.50	8.68***	0.55
Sport PE – School PE	5.71 – 4.92 = 0.79	11.98***	0.82

Note. The statistical significance of each t-value has been adjusted with a Bonferroni correction.

[a] The effect size represents Cohen's (1977, p. 48) $d_{z'}$ for dependent means.

**$p < .01$. ***$p < .001$.

Incremental Predictive Validity of Domain-Specific Grit

If grit is to be conceptualized and measured as a domain-specific construct, it is proposed that a domain-specific measure of grit should account for a significant amount of incremental variance in a theoretically relevant domain-matched criterion variable beyond the variance explained by a global (domain-general) measure of grit. In other words, there would be little value in adopting a domain-specific approach to measuring grit if a global measure accounted for the same (or more) variance in theoretically relevant criterion variables within a particular domain (cf. Schmidt et al., 2017). To investigate this issue, a series of hierarchical regression analyses were conducted to determine (a) if School Grit accounted for variance in student-athletes' GPA beyond the variance accounted for by Global Grit, and (b) if Sport Grit accounted for variance in student-athletes' perfectionistic strivings and perfectionistic concerns in sport beyond the variance accounted for by Global Grit.

Predicting student GPA. Student GPA was chosen as the criterion variable in the first series of hierarchical regression analyses because previous research has shown that domain-general grit is a positive predictor of academic achievement in university students (see Duckworth et al., 2007). The first analysis used data provided by the 190 participants who reported a university GPA, and the second analysis used data provided by the 57 participants who reported a high-school GPA. (Four participants did not provide their GPA and were therefore excluded from both analyses). Gender (coded as: 1 = male, 2 = female) was entered in the first step, Global-CI and Global-PE were entered in the second step, and School-CI and School-PE were entered in the third step of each analysis. Data screening indicated no concerns with multicollinearity (i.e., all variance inflation factors were ≤ 1.83 across the two analyses) and the removal of any individual case from either analysis would have had a negligible impact upon

results (i.e., all Cook's distances ≤ .38).

Gender was a significant predictor of *university* GPA (see Table 6) and accounted for 4.5% of the variance in GPA. The positive regression coefficient (β = .21, $p < .01$) indicates that female student-athletes tended to report higher university GPAs than their male counterparts. The inclusion of the two Global Grit subscales in Step 2 accounted for an additional 4.9% of the variance ($p < .01$) in university GPA beyond gender, with Global-PE being a significant positive predictor of university GPA (β = .22, $p < .01$). The inclusion of the two School Grit subscales in Step 3 accounted for an additional 20.2% of the variance in university GPA ($p < .001$) beyond the variance accounted for by gender and Global Grit, with School-PE primarily contributing to the effect (β = .54, $p < .001$). The results indicate that the inclusion of the two School Grit subscales explained a significant portion of variance in university GPA beyond the variance explained by gender and Global Grit.

Gender was a significant positive predictor of *high-school* GPA (see Table 6) and accounted for 9.4% of the variance. The positive regression coefficient (β = .31, $p < .001$) indicates that female students tended to report higher high-school GPAs than male students. The inclusion of the two Global Grit subscales in Step 2 accounted for an additional 8% of the variance in high-school GPA beyond gender, although the effect was marginal ($p = .08$). Global-PE primarily contributed to the effect (β = .23, $p = .06$). The inclusion of the two School Grit subscales in Step 3 accounted for an additional 8.5% of the variance in high-school GPA, but again the effect was marginal ($p = .06$), with School-PE primarily contributing to the effect (β = .37, $p < .05$). The inclusion of the School Grit subscales explained a significant (albeit marginal) portion of variance in high-school GPA beyond variance explained by gender and Global Grit.

Table 6

Summary of Contributions of Independent Variables Entered at Each Step in Hierarchical Regression Analyses Predicting University and High-School Grade Point Average (GPA)

Predictor	R^2	ΔR^2	ΔF	β	*t*
			University GPA [a]		
Step 1	.04	.04	8.95**		
Gender				.21	2.99**
Step 2	.09	.05	5.034**		
Gender				.22	3.14**
Global CI				.01	0.10
Global PE				.22	2.96**
Step 3	.29	.20	26.344***		
Gender				.13	2.08*
Global CI				-.01	-0.13
Global PE				-.06	-.08
School CI				.00	.00
School PE				.54	6.44***
			High-school GPA [b]		
Step 1	.09	.09	5.72*		
Gender				.31	2.39*
Step 2	.17	.08	2.55†		
Gender				.34	2.67*
Global CI				.14	1.06
Global PE				.23	1.78†
Step 3	.26	.09	2.94††		
Gender				.28	2.27*
Global CI				.17	0.99
Global PE				-.01	-0.03
School CI				-.03	-0.19
School PE				.37	2.42*

Note. Gender coded as 1 = male, 2 = female. Subscale abbreviations: CI = consistency of interests; PE = perseverance of effort.

[a] University GPA (n = 190). [b] High-school GPA (n = 57).

†p = .08. ††p = .06. *p < .05. **p < .01. ***p < .001.

Although the results of the preceding regression analyses provide incremental validity evidence supporting the domain-specific measurement of grit in school (when predicting university and high-school GPA), further validity evidence to support (or refute) the domain-specific measurement of grit was sought by reversing the entry order of the Grit Scales in the regression analyses, whereby the two School Grit subscales were entered in Step 2 and the two Global Grit subscales were entered in Step 3 (cf. Dunn et al., 2011). Reversing the entry order of the scales enables the researcher to determine if Global Grit can explain variance in GPA that was not accounted for by the domain-specific measure of grit. The two School Grit subscales (Step 2) accounted for an extra 24.8% of the variance in university GPA ($p < .001$) beyond gender, whereas the two Global Grit subscales (Step 3) did not account for a significant portion of variance in university GPA ($\Delta R^2 = .003$, $p = .67$) beyond the variance explained by gender and School Grit. Similar results were obtained when predicting high-school GPA. Specifically, the two School Grit subscales (Step 2) accounted for an extra 15% of the variance in high-school GPA ($p < .01$) beyond gender, whereas the two Global Grit subscales (Step 3) did not account for a significant portion of variance in high-school GPA ($\Delta R^2 = .015$, $p = .60$) beyond the variance explained by gender and School Grit. In other words, the results of this second set of regression analyses indicate that Global Grit failed to account for significant amounts of variance in university and high-school GPA beyond the variance explained by the School (i.e., domain-specific) measure of grit. These results support the position that grit should be measured as a domain-specific construct in a school/academic setting.

Predicting perfectionism in sport. Building upon the previous analyses, incremental validity evidence supporting the domain-specific measurement of grit in sport was sought by entering perfectionistic strivings and perfectionistic concerns as the criterion variables in

separate hierarchical regression analyses. In each analysis, gender (coded as: 1 = male, 2 = female) was entered in the first step, Global-CI and Global-PE were entered in the second step, and Sport-CI and Sport-PE were entered in the third step. Data screening indicated no concerns with multicollinearity (i.e., all variance inflation factors ≤ 2.26 across the two analyses) and the removal of any individual case from either analysis would have had a negligible impact upon results (i.e., all Cook's distances ≤ .08).

Gender was a significant positive predictor of perfectionistic strivings (see Table 7) and accounted for 5.6% of the variance. The negative regression coefficient ($\beta = -.24$, $p < .001$) indicates that male student-athletes tended to report higher perfectionistic strivings in sport than female student-athletes. The inclusion of the two Global Grit subscales in Step 2 accounted for an additional 9.6% of the variance ($p < .001$) in perfectionistic strivings beyond gender, with Global-PE being a significant positive predictor of perfectionistic strivings in sport ($\beta = .30$, $p < .001$). The inclusion of the two Sport Grit subscales in Step 3 accounted for an additional 2.8% of the variance in perfectionistic strivings ($p < .05$) beyond gender and Global Grit, with Sport-PE primarily contributing to the effect ($\beta = .25$, $p < .01$). Thus, higher levels of Sport-PE appear to be associated with higher perfectionistic strivings in sport. The results indicate that the inclusion of the two Sport Grit subscales explained a significant portion of variance in perfectionistic strivings beyond the variance explained by gender and Global Grit, thereby supporting the benefits of adopting a domain-specific approach to measuring grit in sport.

Table 7

Summary of Contributions of Independent Variables Entered at Each Step in Hierarchical Regression Analyses Predicting Perfectionistic Strivings and Perfectionistic Concerns

Predictor		R^2	ΔR^2	ΔF	β	*t*
			Perfectionistic strivings in sport			
Step 1		.06	.06	14.81***		
	Gender				-.24	-3.85***
Step 2		.15	.10	14.02***		
	Gender				-.22	-3.75***
	Global CI				.04	0.62
	Global PE				.30	4.85***
Step 3		.18	.03	4.25*		
	Gender				-.24	-4.11***
	Global CI				.09	1.19
	Global PE				.13	1.49
	Sport CI				-.09	-1.24
	Sport PE				.25	2.89**
			Perfectionistic concerns in sport			
Step 1		.00	.00	0.28		
	Gender				.03	.52
Step 2		.03	.03	4.18*		
	Gender				.02	.36
	Global CI				-.04	-.62
	Global PE				-.17	-2.52*
Step 3		.05	.02	1.93		
	Gender				.02	.29
	Global CI				.03	.34
	Global PE				-.10	-1.13
	Sport CI				-.12	-1.55
	Sport PE				-.07	-.70

Note. $N = 251$. Gender coded as 1 = male, 2 = female. Subscale abbreviations: CI = consistency of interests; PE = perseverance of effort.

*$p < .05$. **$p < .01$. ***$p < .001$.

In the second regression analysis, gender was not a significant predictor of perfectionistic concerns in sport (see Table 7), but the inclusion of the two Global Grit subscales in Step 2 accounted for an additional 3.3% of the variance in perfectionistic concerns ($p < .05$). The inclusion of the two Sport Grit subscales in Step 3 failed to account for a significant portion of variance in perfectionistic concerns ($\Delta R^2 = .015$, $p = .15$). In other words, the inclusion of the Sport Grit subscales did not explain a significant portion of variance in student-athletes' perfectionistic concerns beyond the variance explained by gender and Global Grit—a result that does not support the domain-specific measurement of grit in sport.

Similar to the analytic process that was used to predict GPA in school, further validity evidence supporting (or refuting) the domain-specific measurement of grit in sport was sought by reversing the entry order of the grit scales in the regression analyses to predict perfectionistic strivings and perfectionistic concerns. As such, the two Sport Grit subscales were entered in Step 2 and the two Global Grit subscales were entered in Step 3 of each regression analysis. The two Sport Grit subscales (Step 2) accounted for 10.9% of the variance in perfectionistic strivings ($p < .001$) beyond gender, whereas the two Global Grit subscales (Step 3) did not account for a significant portion of variance in perfectionistic strivings ($\Delta R^2 = .016$, $p = .10$) beyond the variance explained by gender and Sport Grit. Similar results were obtained when predicting perfectionistic concerns. Specifically, the two Sport Grit subscales (Step 2) accounted for 4.3% of the variance in perfectionistic strivings ($p < .01$) beyond gender, whereas the two Global Grit subscales (Step 3) did not account for a significant portion of variance in perfectionistic concerns ($\Delta R^2 = .005$, $p = .53$) beyond the variance explained by gender and Sport Grit. The results of this second set of regression analyses (where the entry order of the grit scales was reversed) indicate that Global Grit failed to account for significant amounts of variance in perfectionistic strivings

and perfectionistic concerns in sport beyond the variance explained by the domain-specific measure of grit. These results appear to support the benefits of adopting a domain-specific approach to measuring grit in sport.

Chapter 4: Discussion

The overarching purpose of this investigation was to determine whether grit can or should be conceptualized and measured as a domain-specific construct. To address this question, the first specific purpose of this study was to examine the degree to which grit levels varied (or remained constant) as a function of the situational context that intercollegiate student-athletes considered when providing grit responses. Results of a repeated-measures MANOVA and follow-up mean-contrasts indicated that Sport-CI scores were, on average, significantly higher than both Global-CI and School-CI scores, and that Sport-PE scores were significantly higher than both Global-PE and School-PE scores (see Table 5). In other words, grit levels appear to have differed according to the situational context in which participants considered their grit responses. These differences in grit levels across domains support a domain-specific (rather than domain-general) view of grit (cf. Dunn et al., 2005) and call into question the commonly-held assumption among grit researchers "that the tendency to pursue long-term goals with passion and perseverance is relatively domain general" (Duckworth & Quinn, 2009, p. 173; also see Muenks, Yang, & Wigfield, 2018).

A wide range of studies have assessed the domain-specific versus domain-generality question surrounding the conceptualization and measurement of personality characteristics in the extant literature. For example, in a study of attitudes towards risk-taking behavior, Hanoch, Johnson, and Wilke (2006) reported that individuals (N = 146, 52 female, M age = 28.1, SD = 8.86) who engaged in high levels of risk-taking behaviors in the recreational domain (i.e., sky diving, bungee jumping, hang gliding, and scuba diving) were much less inclined to have a propensity for risk-taking behaviors in other domains including finance and health. In other words, Hanoch et al.'s results indicate that it would likely be inappropriate to measure 'risk-

taking' as a domain-general personality disposition given the apparent differences in the propensity of individuals to endorse risk-taking behaviors in different contexts.

Mitchelson and Burns (1998) examined the domain-specificity of perfectionism in a sample of 64 working mothers—where working mothers were defined as women who were married, worked a minimum of 25 hours a week, and had a child between the ages of 0-8 years. Results from a series of dependent *t*-tests indicated that, on average, working mothers had significantly higher levels of perfectionism in the workplace than at home—results that support the domain-specificity of perfectionism. Kaufman and Baer (2004) examined levels of creativity in undergraduate students across a variety of academic subjects and found that participants had significantly different self-reported levels of creativity in academic subjects that required empathy and communication (e.g., writing and communication), physical agility and hand-eye coordination (e.g., arts, crafts, physical creativity), and spatial visualisation skills or analytic abilities (e.g., math and science). In a study of Grade 7 and Grade 8 middle-school students, Shen, McCaughtry, and Martin (2008) found evidence supporting the domain-specificity of various indicators of motivation (i.e., task value, perceived competence, perceived autonomy, and achievement goals) towards different school subjects. On average, students reported significantly higher motivation in physical education classes in comparison to mathematics classes, leading Shen et al. to conclude that "Specific school subjects can function as an important organizational framework for… [student] motivation" (p. 340).

Another example of a study illustrating the domain-specificity of individual-difference characteristics was conducted by Wolters and Pintrich (1998) who examined test anxiety in a large sample ($N = 545$) of students in Grades 7 – 9. Results indicated that students reported significantly different levels of test-anxiety in mathematics, English, and social studies classes.

This finding is particularly noteworthy because test anxiety is viewed as a "situation-specific [i.e., domain-specific] personality trait" (Sarason & Sarason, 1990, p. 475), yet Wolters and Pintrich's results call into question whether test anxiety would be better measured at an even more situationally-specific level in academic-subject areas (for a related discussion see Goetz, Frenzel, Pekrun, & Hall, 2006). In light of the aforementioned research, there is clear support for the domain-specific treatment of many personality characteristics, and the absolute differences in student-athletes' grit responses across the situational contexts examined in the current study support a domain-specific view of grit (over a domain-general view) in the contexts of sport and school.

Although it is not possible to determine why the current sample of student-athletes reported higher levels of grit in sport than in school and life in general—a clear limitation of the study—it is proposed that having high levels of grit in sport may have been necessary for participants to reach the intercollegiate/varsity level of competition, and without sufficiently high levels of grit in sport they may not have achieved their goals in the sporting context. Grit entails "having a dominant superordinate goal… and tenaciously working toward it in the face of obstacles and setbacks, often for years or decades" (Duckworth & Gross, 2014, p. 321). It is possible that the student-athletes may have been more inclined to maintain their interest, focus, and passion on the accomplishment of their athletic goals (over academic goals) for long periods of time because they deemed it necessary to develop the skills and competencies that would enable them to eventually compete at the varsity level of intercollegiate sport. At the university where this study was conducted there are over 38,000 students, yet fewer than 480 of these students are selected to compete on varsity sport teams. Given the apparent difficulty (from an odds-ratio perspective) of securing a roster spot on a varsity sport team at the university, the goal

of being selected for a varsity team (on average) may have superseded the goal of achieving academic excellence, and this may have impacted (or enhanced) the resulting levels of grit in the domain of sport (although it must be acknowledged that achieving a certain level of academic success was still necessary to gain entry to the university and to maintain academic eligibility to compete on a varsity sport team). Obviously, the cross-sectional research design that was employed in this study greatly limits the extent to which any causal inferences can be generated from the results.

Building upon the previous point (i.e., high levels of grit in sport may have been essential to achieving varsity status in sport), it is possible that the student-athletes regarded their accomplishments in varsity sport as being more important than their academic accomplishments. In other words, the student-athletes (on average) may have placed a higher level of task value (see Eccles et al., 1983) on their sport accomplishments than their academic accomplishments (cf. Dunn et al., 2012). This explanation may be supported by previous research findings showing that consistency of interests (r = .21) and perseverance of effort (r = .31)—when measured as domain-general constructs—have been positively correlated with academic task value in high-school students (Muenks et al., 2018). It is possible that higher levels of grit in a particular domain may partly reflect the degree to which individuals place higher value (or perceived importance) on achievement in that particular domain. It would seem counterintuitive for people to exhibit high levels of grit and persist with passion over long periods of time in achievement contexts where they do not value success. More research is clearly required to determine if perceived task value is associated with the development of domain-specific grit in a person's life.

It is also possible that the student-athletes in this study maintained higher levels of passion and perseverance for long-term goals in sport (in comparison to academic goals) because they felt more competent in the sport domain (than the academic domain). In other words, the student-athletes (on average) may have had higher perceived competence in sport than in the classroom, believing that they were more capable of being successful and achieving their goals in sport than in academic settings (see Dunn et al., 2012). Perceived competence/ability and self-efficacy—defined as an individuals' belief that he/she can successfully accomplish a specific task (Bandura, 1997)—have been positively correlated with grit in a number of studies. For example, both perseverance of effort and consistency of interests have shown small (but significant) positive correlations (rs ≥ .13, ps < .05) with perceived academic ability in academically talented adolescents (Dixson, Worrel, Olszewski-Kubilius, & Subotnik, 2016). Perseverance of effort and consistency of interests have also been positively correlated with academic self-efficacy (rs ≥ .27, ps < .01) in high-school students (M age = 16.32 years: Muenks et al., 2018), and domain-general grit (when treated as a unidimensional construct) has been a significant positive predictor of academic self-efficacy in separate samples of college students from the USA (β = .67, p < .05), Turkey (β = .45, p < .01) and the United Arab Emirates (β = .67, p < .001: see Pasha-Zaidi, Afari, Sevi, Urganci, & Durham, 2018). Given the positive direction of the relationships that are often seen between grit, perceived competence/ability, and self-efficacy (also see Datu, Yuen, & Chen, 2017; Wolters & Hussain, 2015), it is possible that the student-athletes in this study had higher perceived competence and higher self-efficacy in the context of sport than in their academic pursuits.

Expectancy-value theory (see Eccles et al., 1983) provides a possible framework around which the current results may be explained. Expectancy-value theory predicts that performance,

persistence, and task-choice in various achievement domains are directly influenced by the degree to which individuals value success in a particular task/domain and the degree to which they believe that they will be successful in the same task/domain. In a study of 187 academically talented youth (*M* age = 14.68 years) who were attending a residential academic summer program in Ireland, McArdle (2010) reported that students had significantly higher levels of perceived competence and placed significantly more value on success in school than they did in sport. In contrast, in a study of 255 intercollegiate varsity student-athletes, Dunn et al. (2012) reported that participants had higher levels of perceived competence in sport and placed more importance on success in sport than in school. In McArdle's study, the academically gifted students had higher levels of perfectionism in school (than sport) whereas the intercollegiate student-athletes in Dunn et al.'s study had higher levels of perfectionism in sport (than in school). Both McArdle and Dunn et al. posited that perceived competence and perceived task value may be linked to the development of domain-specific perfectionism in sport and academic settings. Given that perfectionism and grit can both be viewed as achievement motivation constructs that may influence certain achievement-striving behaviors in different performance settings, it seems reasonable to speculate that heightened levels of domain-specific grit may correspond with the development of heightened perceived-competence (or self-efficacy) and heightened perceived task-value in different achievement settings. Future research is required to determine the validity of this proposition.

The second purpose of this study was to further examine the domain-specific versus domain-general conceptualization of grit by exploring the degree to which domain-specific measures of grit could explain variance in domain-matched criterion variables that was not explained by a domain-general measure of grit. In the academic domain, results of the

hierarchical regression analyses provided incremental validity evidence supporting the use of a domain- (i.e., school-) specific measure of grit over a domain-general measure of grit to explain variance in student GPA. Similarly, in the sport domain, results of the hierarchical regression analyses provided incremental validity evidence supporting the use of a domain- (i.e., sport-) specific measure of grit over a domain-general measure of grit to explain variance in student-athletes' perfectionistic tendencies in sport.

As shown in Table 6, after controlling for the effects of gender—where results indicated that female participants tended to have higher GPAs than their male counterparts (see Voyer & Voyer, 2014)—the inclusion of the two School Grit subscales explained significant amounts of variance in university and high-school GPA beyond the variance explained by the domain-general measure (i.e., Global Grit). More specifically, the inclusion of the two School Grit subscales explained an additional 20% of the variance in university GPA over and above the variance explained by gender and the two Global Grit subscales. Similarly, the inclusion of the two School Grit subscales explained an additional 9% of the variance in high-school GPA over and above the variance explained by gender and the two Global Grit subscales. In both regression analyses, the perseverance-of-effort subscale of the School Grit scale contributed the most to this effect while the contribution of the consistency-of-interests subscale of the School Grit scale was negligible. These results appear to support the benefits of measuring grit as a domain-specific (as opposed to a domain-general) construct in an academic context.

It is important to note that when the entry order of the School Grit and Global Grit scales was reversed in the regression analyses—whereby the two School Grit subscales were entered in the second step and the two Global Grit subscales were entered in the third step—School Grit explained significant amounts of variance in both university and high-school GPA, whereas

Global Grit did not explain significant amounts of variance in GPA beyond the variance explained by gender and School Grit. In light of the fact that (a) the school-specific measure of grit explained variance in university and high-school GPA beyond the variance explained by the domain-general measure of grit, and (b) the domain-general measure of grit did not explain significant amounts of variance in GPA beyond the domain-specific measure, support for the domain-specific measurement of grit is obtained.

Similar examples of research that have provided incremental validity evidence supporting the use of domain-specific (or context-specific) measures of personality characteristics over domain-general measures can be found in the extant literature. For example, Eschleman and Burns (2012) reported that a context- (i.e., school-) specific measure of the Big Five personality traits explained significant amounts of variance in changes in school satisfaction and citizenship of undergraduate students after controlling for effects of a domain-general (i.e., context-free) measure of the Big Five. Similarly, Bowling and Burns (2010) reported that a context- (i.e., work-) specific measure of four of the Big Five personality traits—namely, conscientiousness, extraversion, agreeableness, and emotional stability—explained significant amounts of variance in job satisfaction, work frustration, intention to change jobs, and absenteeism among a sample of 239 employed adults (aged 20 – 67 years) beyond the variance explained by a context-free (i.e., domain-general) measure of the same personality traits.

In the domain of sport, Martens and Simon (1976) asked a sample of 136 female high-school basketball players to complete a domain-general measure of trait anxiety and a domain- (i.e., sport-) specific measure of trait anxiety. Athletes were also asked to complete a measure of state anxiety ten minutes prior to the start of competition. Martens and Simon reported that the domain-general measure of trait anxiety explained 9% of the variance in athletes' pre-

competitive state anxiety whereas the domain-specific measure of trait anxiety explained 41% of the variance in athletes' state anxiety. In a more recent study conducted in sport by Chen and Chang (2017), the construct of gratitude was assessed among a sample of 167 current and former NCAA Division 1 ($N = 75$), Division 2 ($N = 50$), and Division 3 ($N = 42$) athletes from the USA (aged 18 to 58 years). Chen and Chang found that a domain- (i.e., sport-) specific measure of gratitude explained significant amounts of variance in athlete burnout and team satisfaction beyond the variance explained by gender, age, and a domain-general measure of gratitude (although it should be noted that when the entry order of the gratitude scales was reversed, Chen and Chang reported that the domain-general measure of gratitude also explained a significant amount of unique variance in burnout and team satisfaction beyond the domain-specific measure of gratitude). The aforementioned studies point to the potential benefit of examining certain personality characteristics with domain-specific (as opposed to domain-general) measures.

The regression results surrounding the prediction of student GPA in the current study (see Table 6) appear to mirror the recent findings of Schmidt et al. (2017) who reported that a domain-specific measure of grit in school (as reflected by a composite score based upon the summation of consistency-of-interests and perseverance-of-effort items) was a significant predictor of German high-school students' GPA, whereas a domain-general measure of grit was not a significant predictor of GPA. Unfortunately, Schmidt et al. did not report the entry order of the predictor variables in their regression analysis therefore the degree to which School Grit explained variance in students' GPA beyond the domain-general measure is unclear. By controlling (and reporting) the entry order of the predictor variables—i.e., entering Global Grit before School Grit, and then entering School Grit before Global Grit—this study extends the

findings of Schmidt et al. by providing important information about the degree to which School Grit explained variance in GPA beyond the domain-general measure (and vice versa).

The current study also provided incremental validity evidence supporting the domain-specific measurement of grit in sport. As shown in Table 7, after controlling for the effects of gender—where results indicated that male student-athletes tended to have higher perfectionistic strivings than female student-athletes (cf. Dunn et al., 2005)—the inclusion of the two Sport Grit subscales explained a small but significant amount of variance in participants' perfectionistic strivings in sport beyond the variance explained by the domain-general measure (i.e., Global Grit). More specifically, the inclusion of the two Sport Grit subscales explained an additional 3% of the variance in perfectionistic strivings over and above the variance explained by gender and the two Global Grit subscales. As was the case in the academic domain, the perseverance-of-effort subscale (of the Sport Grit scale) contributed most to this effect. When the entry order of the Global Grit and Sport Grit scales was reversed—i.e., Sport Grit was entered in the second step of the regression analysis and Global Grit was entered in the third step—the two Sport Grit subscales accounted for 10.9% of the variance in perfectionistic strivings beyond gender, whereas the two Global Grit subscales failed to account for a significant portion of variance in perfectionistic strivings beyond gender and Sport Grit. These results support the benefits of measuring grit as a domain-specific construct (as opposed to a domain-general construct) in sport.

Although incremental validity evidence supporting the domain-specific measurement of grit was obtained in the context of predicting perfectionistic strivings in sport, this was not the case when predicting perfectionistic concerns. As seen in Table 7, Global Grit explained a small but significant amount of variance (3%) in perfectionistic concerns beyond gender when entered

in Step 2 of the regression analysis, whereas the addition of the two Sport Grit subscales in Step 3 did not add to the prediction of perfectionistic concerns. When the entry order of the Global Grit and Sport Grit scales was reversed in the regression analysis, the two Sport Grit subscales accounted for a small but significant amount of variance (4.3%) in perfectionistic concerns beyond gender, whereas the two Global Grit subscales (Step 3) did not add to the prediction of perfectionistic concerns. Based upon the current results, there appears to be no clear benefit to measuring grit as a domain-specific or domain-general construct when predicting athletes' perfectionistic concerns in sport.

Taken together, the significant differences in the absolute levels of grit across contexts (i.e., life in general, sport, and school: see Table 5) and the superiority of the domain-specific measures of grit (over the domain-general measure) in explaining variance in domain-matched criterion variables in school (i.e., GPA: see Table 6) and sport (i.e., perfectionistic strivings: see Table 7), provide multiple sources of validity evidence that support the domain-specific conceptualization and measurement of grit in sport and academic contexts. As noted by Messick (1989), obtaining more than one source of validity evidence to support a particular inference/conclusion is always better than obtaining a single source of validity evidence in the construct validation process. Thus, a particular strength of the current study lies in the fact that different sources of validity evidence converged upon the same general conclusion: namely, that there appears to be merit in conceptualizing and measuring grit as a domain-specific construct rather than a domain-general construct.

It is worth noting that in all of the regression analyses (see Tables 6 and 7), regardless of whether a domain-specific or domain-general measure of grit was used to predict GPA or perfectionism (and irrespective of the entry order of the grit scales in the analyses), only the

perseverance-of-effort subscale was a significant predictor of the respective criterion variables, and in no instances was the consistency-of-interests subscale a significant predictor. Following their recent meta-analytic study of grit research, Credé et al. (2017) concluded that "the consistency [of interests] facet of grit add[s] little to our ability to understand or predict academic performance, while the perseverance [of effort] facet does offer an important improvement in explanatory power" (p. 501). The current results (as they relate to predicting GPA) support Credé et al.'s conclusion, and may even extend to the prediction of achievement/performance in sport (although it is acknowledged that perfectionism is not a direct indicator of *performance* in sport). This speculative hypothesis is presented on the basis that a number of studies in the sport psychology literature have previously shown that higher perfectionistic strivings are associated with superior performance in athletic tasks (e.g., Stoeber, Uphill, et al., 2009; Stoll, Lau, & Stoeber, 2008), therefore it is conceivable that higher grit in sport may also be associated with higher performance in sport (cf. Tedesqui & Young, 2018). Future research is clearly required to determine if (a) one or both facets of grit (i.e., consistency of interests and perseverance of effort) contribute to the prediction of athlete performance/achievement in sport, and (b) if a domain- (i.e., sport-) specific measure of grit would be a superior predictor of performance in sport than a domain-general measure.

The third purpose of this study was to explore the relationships between grit and perfectionism in sport. Although no previous study has examined relationships between grit and perfectionism (in sport or non-sport contexts) it was anticipated that both consistency of interests and perseverance of effort would be positively correlated with perfectionistic strivings and negatively correlated with perfectionistic concerns. Bivariate correlations (see Table 4) generally supported this position. Specifically, the two Sport Grit subscales were positively correlated with

perfectionistic strivings (although the correlation between Sport-CI and perfectionistic strivings was not statistically significant) and the two Sport Grit subscales were negatively correlated with perfectionistic concerns. It is also worth noting that the two Global Grit subscales were positively correlated with perfectionistic strivings and negatively correlated with perfectionistic concerns (although the correlation between Global-CI and perfectionistic concerns was not significant). Regardless of whether grit was measured as a domain- (i.e., sport-) specific construct or as a domain-general construct, consistency of interests and perseverance of effort were positively correlated with perfectionistic strivings and negatively correlated with perfectionistic concerns.

The majority of researchers and theorists who study grit present grit as a largely adaptive or beneficial achievement motivation construct that helps people achieve their long-term performance goals (Duckworth et al., 2007; Duckworth & Quinn, 2009; Eskreis-Winkler et al., 2014). Similarly, a considerable body or research evidence exists in the sport perfectionism literature that portrays high perfectionistic strivings as an adaptive motivational construct that is positively linked with a wide range of adaptive cognitive, affective, and behavioral correlates in athletes—primarily when the overlap with perfectionistic concerns is controlled (see Gotwals et al., 2012; Jowett et al., 2016)—and negatively linked with a variety of maladaptive cognitive, affective, and behavioral correlates. It has been proposed that heightened perfectionistic strivings (in the absence of high perfectionistic concerns) give athletes a motivational boost to work hard and give extra effort in pursuit of their high achievement standards (see Stoeber, 2012), especially when faced with setbacks or adversity (see Dunn, Causgrove Dunn, Gamache, & Holt, 2014). Indeed, research in non-sport settings has linked heightened perfectionistic strivings to stronger mastery orientations (Accordino, Accordino, & Slaney, 2000), heightened domain-

specific motivation (Stoeber & Rambow, 2007), heightened persistence/endurance in tasks (Stumpf & Parker, 2000), increased use of active coping strategies (Dunkley, Blankstein, Halsall, Williams, & Winkworth, 2000), and superior achievement (Stoeber & Otto, 2006). It therefore appears to make theoretical sense that the underlying motivational (and performance) benefits that are commonly associated with heightened grit and heightened perfectionistic strivings would be reflected in positive correlations between the constructs. Unfortunately, the cross-sectional correlational design employed in this study makes it impossible to determine if heightened grit may lead individuals to develop heightened perfectionistic strivings, or if heightened perfectionistic strivings may lead individuals to develop heightened grit. Clearly longitudinal research is required to address this important developmental question.

In contrast to the positive relationships observed between grit and perfectionistic strivings, negative relationships were observed between grit and perfectionistic concerns. These inverse relationships also make theoretical sense given that grit is rarely portrayed as a maladaptive or inhibiting construct in the pursuit of achievement goals (see Lucas et al., 2015 and Anestis & Selby, 2015, for exceptions), whereas perfectionistic concerns are typically associated with maladaptive cognitive, affective, and behavioral correlates in sport including (but not limited to) behavioral disengagement (Dunn et al., 2014), a heightened tendency to contemplate quitting sport (Gotwals & Spencer-Cavaliere, 2014), and heightened anxiety (Hall, Kerr, & Matthews, 1998). It would seem to be counterproductive for individuals to have high levels of passion and perseverance for the attainment of long-term goals (i.e., high grit) in any achievement domain and to also have high perfectionistic concerns that may actually impede a person's pursuit of these goals. Research in sport has shown that heightened perfectionistic concerns in athletes are linked to an increased use of avoidance coping in the context of

performance slumps (see Dunn et al., 2014), heightened burnout (see Gotwals, 2011), and a heightened tendency to endorse performance-avoidance and mastery-avoidance goals in competition (see Gucciardi, Mahoney, Jalleh, Donovan, & Parkes, 2012). All of these conditions would likely impede an athlete's progress towards accomplishing long-term goals in sport and would almost certainly be considered antithetical to the passionate and persistent pursuit of long-terms goals that is exhibited by people with high levels of grit. Thus, the negative bivariate correlations between grit and perfectionistic concerns in sport appear to make theoretical sense. Given that this is the first study to examine relationships between grit and perfectionism (in or outside of sport), it is recommended that more research be conducted to assess the relationships between these achievement motivation constructs in different performance domains.

Although not a primary purpose of this study, a brief discussion of the appropriateness of treating grit as a multidimensional (as opposed to a unidimensional) construct is warranted. None of the goodness-of-fit indices obtained from confirmatory factor analyses (see Table 1) that were conducted upon the three versions of the Grit Scale in this study indicated a good (or acceptable) fit for the 1- and 2-factor models (although it should be noted that the 2-factor model did provide a significant improvement in model fit over the 1-factor model for each version of the scale). However, when the data were reanalyzed using exploratory factor analyses (EFA), results provided strong support for the retention of two factors to represent the latent dimensionality of domain-specific and domain-general versions of the scale (see Tables 2 and 3, and Figures 1 – 3). Items designed by Duckworth et al. (2007) to measure perseverance of effort loaded on the first factor and items designed to measure consistency of interests loaded on the second factor in all three solutions. Only one item (i.e., Item 11) failed to demonstrate simple structure in any of the three solutions and was subsequently deleted. The two factors reflect the two facets of grit

that were introduced by Duckworth et al. when they developed the original 12-item domain-general Grit Scale.

The EFA results are noteworthy for two main reasons. First, to the best of the researcher's knowledge, this is the first study to simultaneously examine the latent dimensionality of the Grit Scale in three contexts (i.e., life in general, sport, and school). In doing so, evidence was provided supporting the original dimensionality of the instrument (as proposed by Duckworth et al., 2007) in multiple achievement settings. More importantly, however, the fact that two factors emerged from the EFAs and the inter-factor correlations across the three solutions ranged from .30 to .36 suggests that consistency of interests and perseverance of effort are distinct yet related constructs. As such, these findings call into question the common practice (e.g., Ivcevic & Brackett, 2014; Moles et al., 2017; Mueller et al., 2017; Vainio & Daukantaitė, 2016) of creating a single composite grit score to represent a person's grit level. If there are two distinct factors underlying grit (and these factors are only moderately correlated), the question must be asked whether it is really appropriate to combine scores from both grit factors/subscales into a single composite score? For example, would it be appropriate to assume that a person who has a very high perseverance-of-effort score combined with a moderate consistency-of-interests score would have the same 'grit experiences' or attain the same 'grit outcomes' as a person who has a moderate perseverance-of-effort score combined with a very high consistency-of-interests score? This question seems particularly relevant on both theoretical and empirical grounds given that previous research (see Credé et al., 2017) and the current regression results (see Table 6) indicate that perseverance of effort is generally much more closely associated with academic success (i.e., GPA) than consistency of interests.

A number of studies have provided evidence indicating that perseverance of effort and

consistency of interests have different relationships with a variety of criterion variables (beyond GPA) in achievement settings. For example, Wolters and Hussain (2015) reported that perseverance of effort was a strong significant positive predictor of cognitive strategies (i.e., "use of rehearsal, elaboration, and organization strategies to complete academic tasks" [p. 299]) and metacognitive strategies (i.e., "use of techniques for planning, monitoring, and managing learning strategies" [p. 299]) in the context of academic learning in a sample of university undergraduates, whereas consistency of interests was unrelated to these variables. In contrast, in the domain of sport, Tesdesqui and Young (2017) reported that consistency of interests was negatively correlated (r = -.26, p < .001) with thoughts of quitting sport in a sample of 250 athletes (M age = 23.4, SD = 10.14) who competed at various competitive levels, whereas perseverance of effort was unrelated to thoughts of quitting (r = .03). On the basis of the results following their meta-analysis of grit research, Credé et al. (2017) went so far as to conclude that,

> the practice of combining perseverance scores and consistency scores into an overall grit score appears to result in a significant loss in the ability to predict performance. That is, perseverance is a much better predictor of performance than either consistency or overall grit and should therefore probably be treated as a construct that is largely distinct from consistency to maximize its utility. (p. 502)

Given that (a) previous research and the current regression results (see Tables 6 and 7) indicate that perseverance of effort and consistency of interests have different relationships with a variety of criterion variables in different achievement settings, and (b) the current EFA results (see Table 3) support a multidimensional conceptualization of grit, it appears that there are empirical grounds to continue treating grit as a multidimensional (as opposed to a unidimensional) construct. Although grit has been studied extensively over the past decade since Duckworth et al.

(2007) developed the Grit Scale (for a review see Credé et al., 2017), construct validation is a never-ending process (Messick, 1989) and so continued examination of the benefits and limitations of treating grit as a unidimensional or multidimensional construct is recommended.

Limitations and Future Directions

Although this research provides important insights into the domain-specificity of grit, the dimensionality of grit, and the relationships between grit, academic achievement (i.e., GPA), and perfectionism in sport, there are a number of limitations that must be acknowledged. First, it should be noted that the majority of the effect sizes that corresponded with significant mean differences in grit levels between life in general, sport, and school were moderate in size (see Table 5), with only the effect size corresponding to the difference between perseverance of effort in sport versus school being large (*ES* = .82). Researchers would likely have greater confidence in making inferences about absolute differences in domain-specific levels of grit if larger effect sizes had been obtained. Moreover, it cannot be assumed that the direction of the mean differences in grit that were obtained in this study (i.e., grit in sport was higher than grit in school) would hold up if a different sample of individuals had provided data. It would seem likely that grit levels in school, for example, might be higher than grit levels in sport if a homogeneous sample of academically gifted students had been asked to provide their grit responses in the context of sport and school (cf. McArdle, 2010). More research is clearly required to further explore differences in domain-specific levels of grit in different samples across different achievement domains.

Another potential limitation of this study relates to the psychometric properties of the grit scales. As noted previously, the confirmatory factor analyses that were conducted upon the three versions of the scale provided model-fit indices (see Table 1) that failed to support the retention

of the 1-factor and 2-factor models. Although the exploratory factor analyses provided support for a 2-factor solution in each version of the scale (after Item 11 had been deleted), it is possible that alternative models/solutions may have been overlooked. Indeed, the deletion of Item 11 (*I have difficulty maintaining my focus on projects that take more than a few months to complete*) may have undermined the content representativeness (Messick, 1989) of the consistency-of-interests subscale in each instrument, that in turn may have impacted the magnitude of the relationships between consistency of interests and GPA/perfectionism. It is recommended that researchers continue to evaluate the latent dimensionality and latent structure of domain-specific and domain-general versions of the Grit Scale.

Another potential limitation of the current study was the reliance on self-report measures for all variables. This reliance may have created some common methods variance (Podsakoff, MacKenzie, & Podsakoff, 2012) that impacted the magnitude of the relationships between the variables (see Siemsen, Roth, & Oliveira, 2010). Future research that explores issues pertaining to the domain-specificity of grit (via the establishment of incremental validity evidence) may be enhanced if the criterion variables that are used in regression analyses are, for example, based upon behavioral or observational data (e.g., third party observations of the amount of time participants spent studying for school or training in the gym for sport). Moreover, considering the cross-sectional nature of this current study (which precludes the opportunity to make any sort of causal inferences), longitudinal research may be helpful in determining if, when, and how differences in domain-specific grit emerge in different achievement contexts.

As noted previously, limitations surrounding the generalizability of the results to other populations, including student-athletes at other post-secondary institutions, must also be acknowledged. Unless research is conducted with other samples of student-athletes from other

post-secondary institutions, it would be dangerous to conclude that similar differences in grit levels in sport and school would be obtained. For example, the current sample attended a university where high levels of both athletic and scholastic excellence are typically expected and achieved. The magnitude and direction of differences in domain-specific grit in sport and school may be quite different among samples of student-athletes who attend post-secondary institutions where greater (or lesser) emphasis is placed upon the attainment of either athletic or scholastic excellence.

Another potential limitation of this study relates to the degree of context-specificity (or lack thereof) that was used to assess grit. For example, research in test anxiety has shown that test-anxiety levels can differ as a function of the specific academic subject in which tests are taken (see Wolters & Pintrich, 1998). It is possible that domain-specific grit levels may have differed if the student-athletes had been asked to consider their school-related grit in different academic-subject areas, or sport-related grit levels may have differed had participants been asked to consider their grit levels in the technical, tactical, physical, or mental aspects of their sport. Obviously, the more context-specific measurement becomes, the less generalizable results become to other situations. However, from the perspective of sport practitioners, it may be most beneficial for a coach to be aware that some athletes might lack grit in the pursuit of their physical goals (e.g., strength, stamina, agility, etc.) but have high levels of grit in the pursuit of their technical or tactical goals. Clearly more research in this area is required to assess the benefits of measuring grit at a more micro-contextual level within achievement domains.

Finally, it must be acknowledged that although this is the first study to explore relationships between grit and perfectionism in sport, perfectionistic strivings and perfectionistic concerns may not have been the best choice for criterion variables in the regression analyses

when searching for incremental validity evidence to support (or refute) the domain-specific conceptualization of grit in sport. As discussed previously, neither the sport-specific nor domain-general measures of grit accounted for significant amounts of unique variance in student-athletes' perfectionistic concerns in sport beyond the other measure. Perhaps the selection of other criterion variables that have already demonstrated associations with grit in sport (e.g., weekly amounts of deliberate practice, levels of engagement in different practice contexts: see Tedesqui & Young, 2017, 2018) may have provided 'better' validity evidence that supported (or refuted) the domain-specificity of grit in sport. Alternatively, perfectionism could have instead been measured as a domain-general construct as opposed to a domain-specific construct (see Dunn et al., 2005), in which case it might be anticipated that the domain-general measure of grit would have been a stronger predictor of domain-general perfectionism than the sport-specific measure of grit. It is recommended that future research select different criterion variables that enable researchers to further assess the predictive power of domain-specific and domain-general measures of grit in different achievement contexts.

Conclusion

Despite the aforementioned limitations, this thesis revealed differences in grit levels in the domains of sport and school, and when the results of the current study are considered in conjunction with the recent findings of Schmidt et al. (2017), there would appear to be value in further assessing the appropriateness of conceptualizing and measuring grit as a domain-specific construct. To the best of the researcher's knowledge, this study is the first of its kind to administer a domain-specific measure of grit in sport to athletes competing at the intercollegiate (varsity) level, and the first to study relationships between grit and perfectionism. Although the focus throughout this thesis was upon the manifestation of grit in student-athletes, the results

may also have broader implications for other individuals who are engaged in achievement contexts that require them to "[put] one foot in front of the other", "hold fast to an interesting and purposeful goal", and "invest, day after week after year, in challenging practice" (Duckworth, 2016, p. 275). Determining whether grit can or should be conceptualized and measured as a domain-specific construct will not only enhance the research community's theoretical understanding of grit, but may also present opportunities for the development of domain-specific measures that could shed more light upon the role that grit plays in the lives of individuals in different achievement contexts (see Meyer et al., 2017) as attempts are made to learn more about dispositional tendencies that might impact success and long-term achievement.

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Appendix A

Demographic Questionnaire

INSTRUCTIONS Please provide your answers in the spaces provided to the following questions:

Please indicate your age (in years): _____

Please specify your ethnicity (please check one):

- ☐ Asian
- ☐ Black / African American
- ☐ Indigenous Peoples
- ☐ Hispanic / Latino
- ☐ White
- ☐ Other

Please indicate the Faculty you are currently enrolled in at the University of Alberta:

Please indicate your grade point average (GPA) from the previous academic year. If you are in your first year, please report your average percentage grade from high school:

_____

Please indicate the varsity sport you participate in at the University of Alberta:

_____

Are you competing on a male or female varsity team (please check one box):

- ☐ Male
- ☐ Female

Please indicate the number of years you have <u>competed at the intercollegiate varsity level</u> in your current sport (please check one box):

- ☐ 1st year
- ☐ 2nd year
- ☐ 3rd year
- ☐ 4th year
- ☐ 5th year

Please indicate the <u>total number of years</u> you have competed in your sport (i.e., including varsity <u>and</u> the years before you became a varsity athlete): _____

Appendix B

Global Grit Scale

Instructions: Listed below are a number of statements that may or may not apply to you **in your life in general**. There are no right or wrong answers, so please don't spend too much time on any one statement. Just circle the number beside each statement that best describes you **in every-day life.**

		Not at all like me			**Somewhat like me**			**Exactly like me**
1.	I often set a goal but later choose to pursue a different one.	1	2	3	4	5	6	7
2.	I have achieved a goal that took years of work.	1	2	3	4	5	6	7
3.	New ideas and goals sometimes distract me from previous ones.	1	2	3	4	5	6	7
4.	I have overcome setbacks to conquer an important challenge.	1	2	3	4	5	6	7
5.	I become interested in new pursuits/goals every few months.	1	2	3	4	5	6	7
6.	I finish whatever I begin.	1	2	3	4	5	6	7
7.	My interests change from year to year.	1	2	3	4	5	6	7
8.	Setbacks don't discourage me.	1	2	3	4	5	6	7
9.	I have been obsessed with a certain idea or goal for a short time but later lost interest.	1	2	3	4	5	6	7
10.	I am a hard worker.	1	2	3	4	5	6	7
11.	I have difficulty maintaining my focus on projects/goals that take more than a few months to complete.	1	2	3	4	5	6	7
12.	I am diligent.	1	2	3	4	5	6	7

Appendix C

Sport Grit Scale

Instructions: Listed below are a number of statements that may or may not apply to you **as an athlete in sport**. There are no right or wrong answers, so please don't spend too much time on any one statement. Just circle the number beside each statement that best describes you **as an athlete in sport.**

		Not at all like me			**Somewhat like me**			**Exactly like me**
1.	As an athlete in sport, I often set a goal but later choose to pursue a different one.	1	2	3	4	5	6	7
2.	As an athlete in sport, I have achieved a goal that took years of work.	1	2	3	4	5	6	7
3.	As an athlete in sport, new ideas and goals sometimes distract me from previous ones.	1	2	3	4	5	6	7
4.	As an athlete in sport, I have overcome setbacks to conquer an important challenge.	1	2	3	4	5	6	7
5.	As an athlete in sport, I become interested in new pursuits/goals every few months.	1	2	3	4	5	6	7
6.	As an athlete in sport, I finish whatever I begin.	1	2	3	4	5	6	7
7.	As an athlete in sport, my interests change from year to year.	1	2	3	4	5	6	7
8.	As an athlete in sport, setbacks don't discourage me.	1	2	3	4	5	6	7
9.	As an athlete in sport, I have been obsessed with a certain idea or goal for a short time but later lost interest.	1	2	3	4	5	6	7
10.	As an athlete in sport, I am a hard worker.	1	2	3	4	5	6	7
11.	As an athlete in sport, I have difficulty maintaining my focus on projects/goals that take more than a few months to complete.	1	2	3	4	5	6	7
12.	As an athlete in sport, I am diligent.	1	2	3	4	5	6	7

Appendix D

School Grit Scale

Instructions: Listed below are a number of statements that may or may not apply to you **as a student**. There are no right or wrong answers, so please don't spend too much time on any one statement. Just circle the number beside each statement that best describes you **in your academic pursuits at school.**

		Not at all like me						**Exactly like me**
				Somewhat like me				
1.	In my academic pursuits, I often set a goal but later choose to pursue a different one.	1	2	3	4	5	6	7
2.	In my academic pursuits, I have achieved a goal that took years of work.	1	2	3	4	5	6	7
3.	In my academic pursuits, new ideas and goals sometimes distract me from previous ones.	1	2	3	4	5	6	7
4.	In my academic pursuits, I have overcome setbacks to conquer an important challenge.	1	2	3	4	5	6	7
5.	In my academic pursuits, I become interested in new pursuits/goals every few months.	1	2	3	4	5	6	7
6.	In my academic pursuits, I finish whatever I begin.	1	2	3	4	5	6	7
7.	In my academic pursuits, my interests change from year to year.	1	2	3	4	5	6	7
8.	In my academic pursuits, setbacks don't discourage me.	1	2	3	4	5	6	7
9.	In my academic pursuits, I have been obsessed with a certain idea or goal for a short time but later lost interest.	1	2	3	4	5	6	7
10.	In my academic pursuits, I am a hard worker.	1	2	3	4	5	6	7
11.	In my academic pursuits, I have difficulty maintaining my focus on projects/goals that take more than a few months to complete.	1	2	3	4	5	6	7
12.	In my academic pursuits, I am diligent.	1	2	3	4	5	6	7

Appendix E
Perfectionism Measure

INSTRUCTIONS The purpose of this questionnaire is to identify **how players view certain aspects of their competitive experiences in sport**. Please help us to more fully understand how players view a variety of their competitive experiences by indicating the extent to which you **agree or disagree** with the following statements. (Circle one response option to the right of each statement). Some of the questions relate to your sport experiences in general, while others relate specifically to experiences on the team that you have most recently played with. **There are no right or wrong answers** so please don't spend too much time on any one statement; simply choose the answer that best describes how you view each statement.

	To what extent do you agree or disagree with the following statements?	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1.	If I do not set the highest standards for myself in my sport, I am likely to end up a second-rate player.	1	2	3	4	5
2.	Even if I fail slightly in competition, for me, it is as bad as being a complete failure.	1	2	3	4	5
3.	In sport, I strive to be as perfect as possible.	1	2	3	4	5
4.	In sport, I become furious if I make mistakes.	1	2	3	4	5
5.	I hate being less than the best at things in my sport.	1	2	3	4	5
6.	If I fail in competition, I feel like a failure as a person.	1	2	3	4	5
7.	In sport, I am a perfectionist as far as my targets are concerned.	1	2	3	4	5
8.	The fewer mistakes I make in competition, the more people will like me.	1	2	3	4	5
9.	It is important to me that I be thoroughly competent in everything I do in my sport.	1	2	3	4	5
10.	In sport, I get frustrated if I do not fulfill my high expectations.	1	2	3	4	5
11.	I think I expect higher performance and greater results in my daily sport-training than most players.	1	2	3	4	5
12.	In sport, it is important to me to be perfect in everything I attempt.	1	2	3	4	5
13.	I feel that other players generally accept lower standards for themselves in sport than I do.	1	2	3	4	5
14.	I should be upset if I make a mistake in competition.	1	2	3	4	5
15.	In sport, I feel extremely stressed if everything doesn't go perfectly.	1	2	3	4	5

Please complete the remaining items in this questionnaire on the next page. ☞

	To what extent do you agree or disagree with the following statements?	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
16.	If a team-mate or opponent (who plays a similar position to me) plays better than me during competition, then I feel like I failed to some degree.	1	2	3	4	5
17.	If I do not do well all the time in competition, I feel that people will not respect me as an athlete.	1	2	3	4	5
18.	In sport, I want to do everything perfectly.	1	2	3	4	5
19.	I have extremely high goals for myself in my sport.	1	2	3	4	5
20.	If something doesn't go perfectly during competition, I am dissatisfied with the whole performance.	1	2	3	4	5
21.	I set higher achievement goals than most athletes who play my sport.	1	2	3	4	5
22.	In sport, I feel the need to be perfect.	1	2	3	4	5
23.	People will probably think less of me if I make mistakes in competition.	1	2	3	4	5
24.	In sport, I feel depressed if I have not been perfect.	1	2	3	4	5
25.	If I play well but only make one obvious mistake in the entire game, I still feel disappointed with my performance.	1	2	3	4	5

Appendix F

Athlete Letter

Study Title: **Personality Characteristics Associated with Achievement Motivation in Sport and School.**

Investigator:
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Dear varsity athlete,

The purpose of this letter is to ask you to consider participating in a research project. The project is titled ***Personality Characteristics Associated with Achievement Motivation in Sport and School***. The project is part of Danielle Cormier's M.A. thesis research in the area of sport psychology at the University of Alberta (supervised by Dr. John Dunn).

The purpose of this study is to investigate whether the personality characteristic of "grit" (which reflects the degree to which people pursue long term goals) is stable in different achievement contexts: we are mainly interested in sport settings, school/academic settings, and 'life in general'. The results of this study will have no direct benefits to you at this time. It is hoped that the information you provide will help researchers better understand how personality characteristics of varsity athletes operate in different achievement settings.

We would ask that you fill out the attached package. The package consists of a brief demographic survey and four questionnaires. This package should only take about 20 minutes to complete. You will be asked to provide information about your experiences and attitudes in a variety of achievement settings including sport, academics, and 'life in general'. You will ***not*** be asked to put your name on anything. No individual information will be shared with anyone other than the researchers at any time. All data will be coded and stored in a locked office at the University of Alberta. There are no known risks involved with the research.

Please understand that your participation in the study is voluntary. ***Completion and return of the package indicates your consent to participate in this study***. Not returning the package or returning a blank (uncompleted) package will indicate a decision ***not*** to participate. You are free to ignore any questions that you do not wish to answer. You may decline to participate or withdraw from the study at any time for any reason without consequence. This decision will not impact your standing with your schooling or your team in any way. A decision to withdraw can be done either verbally or in writing to any member of the research team at any time. However, once you have returned your questionnaires, withdrawing your data will be difficult due to the anonymous nature of your responses. We ask that you refrain from talking to other athletes (from

other teams) about the study until it is completed. This will ensure that all participants in the study have the same set of research conditions that you experience.

The information that you provide will only be accessed by the research team (i.e., Danielle Cormier and Dr. John Dunn). However, given that no personal responses will be gathered that can be used to identify any individual, the researchers will have no access to the identity of participants and non-participants. Information is kept for a period of five years following any publication of the group information. After 5 years, all individual information will be destroyed. You can obtain a free copy of the final report by contacting Danielle Cormier or Dr. John Dunn when the report has been completed in September, 2018.

Please contact Danielle Cormier (e-mail: dlcormie@ualberta.ca) or Dr. John Dunn (phone: 780-492-2831 or email: john.dunn@ualberta.ca) with any questions or concerns. The plan for this study has been reviewed and approved by a Research Ethics Board at the University of Alberta. Questions about your rights as a research participant may be directed to the University of Alberta Research Ethics Office at (780) 492-2615. This office has no direct involvement with this project.

We hope that you will consider this request to participate. We want to remind you that this request is for one 20-minute session. We would also like to remind you that ***completion and return of the package indicates your consent to participate in this study***. Not returning the package or returning a blank (uncompleted) package will indicate a decision ***not*** to participate. If you wish to know more about our current research program before making any decision, a summary of Dr. John Dunn's research interests and sport psychology work can be found at the following website: http://www.ualberta.ca/~jdunn.

Thank you for your consideration.

Danielle Cormier, B.A.
(M.A. Student)

John G.H. Dunn, PhD
(Supervisor)

Appendix G

Pattern Coefficients for Principal Axis Factor Analyses with Direct Oblimin Rotations of Global, Sport, and School Grit Scales with Item 11 Removed

		Global		Sport [a]		School [b]	
	Item descriptions	*F1*	*F2*	*F1*	*F2*	*F1*	*F2*
1.	I often set a goal but later choose to pursue a different one.	.19	**.40**	.10	**.66**	.15	**.62**
2.	I have achieved a goal that took years of work.	**.49**	.01	**.68**	.00	**.65**	-.11
3.	New ideas and projects/goals sometimes distract me from previous ones.	.00	**.60**	.03	**.77**	.08	**.74**
4.	I have overcome setbacks to conquer an important challenge.	**.62**	-.02	**.71**	-.03	**.55**	-.08
5.	I become interested in new pursuits/goals every few months.	-.15	**.77**	-.20	**.71**	-.21	**.73**
6.	I finish whatever I begin.	**.58**	.19	**.66**	.12	**.52**	.28
7.	My interests change from year to year.	-.04	**.66**	.10	**.68**	-.04	**.67**
8.	Setbacks don't discourage me.	**.39**	-.05	**.33**	-.02	**.33**	.15
9.	I have been obsessed with a certain idea or project/goal for a short time but later lost interest.	.13	**.59**	.21	**.59**	.17	**.59**
10.	I am a hard worker.	**.71**	-.06	**.72**	-.03	**.86**	.03
12.	I am diligent.	**.73**	.10	**.71**	.11	**.79**	.04

Note. Pattern coefficients >.30 are in boldface.

[a] Items were preceded by the phrase, "*As an athlete in sport…*" [b] Items were preceded by the phrase, "*In my academic studies…*"