

# The Role of Grit in Education: A Systematic Review

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## Abstract

Grit is a non-cognitive factor that has received increased attention lately, since research indicates that it plays a significant role in successful outcomes in many fields, and more specifically in education. Grit is rooted in two facets, perseverance of effort and consistency of interest, captured by the Grit Scale. The current systematic review aimed at investigating the association of grit with positive educational outcomes, by exploring both antecedents and outcomes of grit. We identified 29 studies assessing grit in an educational context, published between 2012 and 2017. The primary findings demonstrated that grit shows weak to moderate correlations with educational variables. Its two facets play different roles, with perseverance being a stronger positive predictor of academic performance. Finally, positive variables, such as hope, positive affect and family relationships can foster grit. However, a deeper understanding of the grit construct is essential to distinguish it from facets of the conscientiousness dimension of personality. The usefulness of findings for policy makers and education professionals is discussed, as well as the importance of reinforcing grit in the educational community in order to nurture character in students and enhance their potential.

## Keywords

Grit, Education, Perseverance of Effort, Consistency of Interest, Positive Educational Outcomes

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## 1. Introduction

During the last decade, there has been an increasing interest in identifying factors that make individuals excel and be more successful compared to others of equal intelligence, especially in the field of education (Duckworth, Peterson, Matthews, & Kelly, 2007). Apart from cognitive ability, talent and opportunity,

high achievers demonstrate a variety of non-cognitive or motivational characteristics such as creativity, commitment, emotional intelligence, growth mindset, gratitude, self-confidence, and emotional stability (Duckworth, et al., 2007; Dweck, Walton, & Cohen, 2014). Such qualities have been found to positively impact academic outcomes, social relationships, as well as psychological and physical well-being (Duckworth & Gross, 2014; Duckworth & Yeager, 2015).

One of the non-cognitive factors that has received increased focus during the last few years is grit. Grit is considered by scholars as a performance character strength, drawn upon to achieve one's potential in a particular challenge (Soutter & Seider, 2013). Research on grit has been mainly conducted by Angela Duckworth at the University of Pennsylvania. She defines grit as "the perseverance and passion for long term goals" (Duckworth et al, 2007: p. 1087). Grit entails working persistently and vigorously towards a challenging goal, sustaining effort and keeping an unabated interest over long periods of time despite failure, setbacks and obstacles, and phases of stability in the course of progress. Gritty individuals employ stamina to stay on track and attain their goals, contrary to individuals low in grit who get easily bored or disappointed and give up effort or choose alternative actions (Duckworth et al, 2007). Grit is considered a personal quality common in leaders, and an important antecedent of success and excellence in every domain regardless of giftedness or talent (Duckworth et al, 2007; Duckworth & Yeager, 2015).

Grit is embedded in two main facets: perseverance of effort and consistency of interest. Interest is not associated with pleasure in terms of immediate short-term gratification, but rather with meaning. Individuals must first assign a personal meaning to a long-term goal and demonstrate passion to confront the adversity and hardship that may occur when attaining it. A long-term goal needs to be not only significantly meaningful, but also engaging; to sustain the individual's effort and vigor (Perez, 2015). Both facets of grit are fundamental ingredients of success, since perseverance of effort contributes to the achievement of mastery despite failure, and consistency of interest is essential in engaging in deliberate practice to reach mastery (Credé et al., 2016). The distinction between the two aspects of grit is captured by the Grit Scale, a 12-item self-report questionnaire (Duckworth et al., 2007) and its short version, the 8-item Grit Scale-S (Duckworth & Quinn, 2009). Most research considers grit as an overall score on the scale, while there are cases where the two facets are explored as two separate constructs (Credé, Tynan, & Harms, 2016).

During the last decade, the majority of studies have tried to identify the predictive role of grit in academic achievement and other educational outcomes. A series of studies by Duckworth et al. (2007) suggested that grit is a significant predictor over and above IQ regarding successful outcomes in education. Grittier individuals were found to attain higher levels of education, make fewer career transitions, and undergraduates in a high standard university achieved higher Grade Point Averages (GPA) compared to less gritty counterparts. Grit was also a better predictor of West Point military academy summer retention of

cadets compared to self-control. Additionally, Duckworth, Quinn and Seligman (2009) found that grit and life satisfaction significantly predicted teacher effectiveness measured in terms of the academic performance of their students. A recent meta-analysis by Credé et al. (2016) showed that grit demonstrates moderate correlations with performance and retention, and strong correlation with conscientiousness. The meta-analysis also revealed that the “effort” facet accounts for variance in academic performance above and beyond conscientiousness, indicating it should be explored as a separate construct.

Research on the role of grit in educational outcomes may still be in its infancy; nonetheless, it has already received some criticism. Duckworth et al. (2015) admit that the measurement of grit addresses individual differences, but leaves aside situational factors that may influence success. Anderson, Turner, Heath and Payne (2016) criticize the concept, pointing out, for example, that grit is controversial, often presented as a panacea in research, or as a counterproductive mechanism if it is excessive, that it may undermine equality in education and put the blame on low socioeconomic status students for their poor achievements, or that it is not always linked with creative success.

Based on the above, the present systematic review aims at exploring the role of grit and its two facets in educational and academic outcomes, with the hope of facilitating its understanding. We also hope to detect the factors which may lead individuals to cultivate it as a positive characteristic in their academic and life course. Contrary to the recent meta-analysis by Credé et al. (2016), which has addressed grit in terms of performance and retention, conscientiousness, cognitive ability and several demographic variables, the current systematic review focuses exclusively on the role of grit in the educational sector as presented in the literature during the last six years (2012-2017). Hence, the review sets out to answer the following research questions: a) which positive educational outcomes is grit associated with, and which ones can it predict? b) are the two facets of grit (effort and interest) playing the same role in educational outcomes? and c) which variables are predictors of grit in education?

## 2. Method

### Literature Search and Selection Criteria

Initially, we searched Google Scholar to identify relevant research from 2012 to 2017. Key search terms were “grit\$” and/or “effort”, “perseverance”, “passion”, “interest” “non-cognitive” combined with “education”, “(academic) perform\$”, “success\$”, “achieve\$”, “school”, “college” (the symbol \$ was used to broaden the search by identifying words of the same stem). This procedure yielded too many results, since some sources appeared more than once. Scopus database was also searched to retrieve any undetected articles, using the same terms, but search results did not yield any new sources. Therefore, after duplicates were removed, book chapters, magazine articles and poster presentations were eliminated ( $n = 24$ ), all the remaining available sources relevant to the objective of the systematic review were retrieved. Based on titles and abstracts 150 sources were

kept for further processing.

Studies had to meet the following inclusion criteria in order to be considered for the review: the official publication date should range between 2012 and 2017; the publication should be a peer-reviewed journal article; the study should be a full-text article published in English; the term “grit” should appear in the title and/or abstract; the article should present primary data (no meta-analysis or review); and the article should have a DOI (Digital Object Identifier). We excluded unpublished research (e.g. working papers), theses/dissertations, and conference proceeding papers as well as book chapters and magazine articles. In case of uncertainty based on abstracts, the entire text was screened.

After the application of the inclusion/exclusion criteria on the 150 studies, we excluded 91 papers and we narrowed the material down to 59 studies. Extra inclusion criteria were applied: studies should only be quantitative, the sample had to be comprised by minimum 100 participants (to increase ecological validity) who should only be students (from all the levels of education), and grit had to be conceptualized based on Duckworth’s theoretical model (perseverance of effort, consistency of interest) and measured with the Grit Scale (original or short version, or items adapted from this scale, instead of resilience scales or scales that measured other relative constructs, such as ambition). Therefore, the full-texts of the 59 studies were examined thoroughly. Four qualitative studies, 7 studies on cadets and teachers, 3 validation studies of the Grit Scale, and studies that did not meet the criteria were eliminated. Eventually, 29 studies were eligible for the systematic review. **Figure 1** illustrates the steps of the search and sifting procedure.

### 3. Results

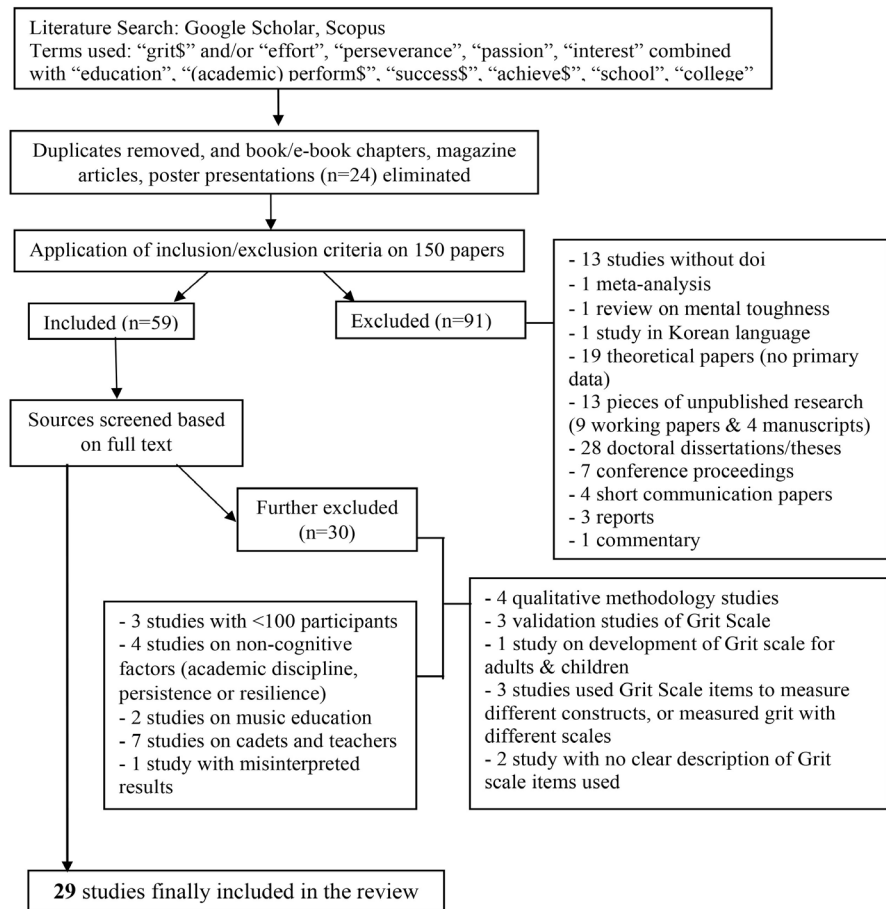
The twenty nine studies that were included in the systematic review are presented in detail in **Table 1**.

#### 3.1. Characteristics of Reviewed Studies

From the 29 studies reviewed, 11 were published in 2017, 9 studies were published in 2016, 3 studies in 2015 and 6 in 2014. There were no studies from the year 2013 and 2012 meeting the inclusion criteria. Twenty five studies were cross-sectional (86%). There was also 1 longitudinal (prospective) study, 1 study with a pre-post design, 1 study including 2 studies (1 cross sectional and 1 longitudinal study), and 1 genetically sensitive sample research on twin teenage student pairs. All studies used quantitative methods, except for one cross-sectional study that used mixed methods for data analysis. Twenty six studies used regression analyses (90%), amongst other statistical analyses.

#### 3.2. Demographic Characteristics

The sample size ranged from 105 to 4813 participants. In all the studies participants were students attending several levels of education (primary school to



**Figure 1.** Flow diagram of study selection process for the systematic review.

university) since student status was part of the inclusion criteria. In the majority of studies (52%) students attended college or university, and in 15 out of the 29 studies the majority of participants were females. Most studies used student samples from the US, but there were also samples from Korea, Canada, Australia, Turkey, Peru, Austria and the UK. The US samples consisted of White Caucasian, Latino/Hispanic, Black Americans and Asian/Asian Americans.

### 3.3. Main Results

The reviewed studies addressed all three research questions. Some of them addressed more than one question. Grit has been found to associate with a range of positive outcomes in education, such as academic performance and retention in education. Its two dimensions were found to correlate with different educational variables. Positive psychology variables were found to predict grit in the educational context.

**Grit and positive educational outcomes.** Sixteen studies investigated grit as a unidimensional factor that relates to and can predict several educational outcomes. Most studies found a positive link between grit and academic performance reflected in measures such as GPAs, and other positive educational outcomes, such as retention, to education.

**Table 1.** Studies included in the review.

Citation	Study Aim	Study Design	Sample size and characteristics	Data/Statistical Analysis	Results
Akin & Arslan (2014)	To explore the association between grit and four achievement goals (learning-approach/avoidance, performance-approach/avoidance).	Cross-sectional survey	<i>N</i> = 509 University students in Turkey (60% male)	Correlation, multiple regression	Grit was positively related to learning-approach goal orientations and negatively to learning-avoidance, performance-approach and performance-avoidance goal orientations. Learning-approach goal orientation positively predicted grit. All other goal orientations negatively predicted grit.
Eskreis-Winkler, Shulman, Beal, & Duckworth (2014)	To investigate the association between grit, other individual difference variables, and retention in four different contexts: military, workplace sales, high school, and marriage.	Cross-sectional online survey (study 3)	<i>N</i> = 4813 students from 98 Chicago Public schools; 45% Hispanic, 43% Black; 58% male.	Correlations, binary logistic regression, hierarchical logistic regression	Grit correlated with both academic conscientiousness and school motivation. Grit remained a significant predictor of graduation after controlling for all measured individual difference variables and situational variables, as well as standardized achievement test scores and demographic covariates. Gritty juniors were more likely to graduate from high school their senior year.
Galla, Plummer, White, Meketon, D'Mello & Duckworth (2014)	To develop and validate the Academic Diligence Task (ADT), designed to assess the tendency to expend effort on academic tasks which are tedious in the moment but valued in the long term.	Cross-sectional study (experimental)	<i>N</i> = 921 high school US seniors; 36% Black, 33% White, 21% Asian; 49% female; 55% from low income families	Multilevel growth curve analyses, intercorrelations, partial correlations, simultaneous regression models	Grit predicted unique variance in ADT performance when controlling for agreeableness. Performance on the ADT was associated with individual differences in grit above and beyond demographics, intelligence, and attitudes toward math. Finally, Big Five agreeableness did not confound the association between performance on the ADT and grit.
Ivcevic & Brackett (2014)	To examine validity of three proposed self-regulation predictors of school outcomes—Conscientiousness, Grit and Emotion Regulation Ability (ERA).	Cross-sectional study	<i>N</i> = 213 students from secondary grade level (94.3%) and college preparatory year (5.9%); 52.6% males; 74.4% White/Caucasian, 13.7% Asian/Asian-American.	Correlations, hierarchical regression analyses	Grit did not correlate significantly with GPA and academic honors, but correlations with the remaining school outcomes were low but significant. All school outcomes were significantly predicted by Conscientiousness and ERA, but not Grit. Grit (Step 2) did not explain additional variance in school outcomes beyond personality.
Strayhorn (2014)	To test the role of grit in explaining the academic success of Black male collegians' at predominantly White institutions and explore whether grit adds incremental predictive validity in explaining college grades over and beyond traditional measures.	Cross-sectional survey	<i>N</i> = 140 Black male students who were enrolled full time at a large, predominantly White, public research university (61% first-generation; 86% lived on-campus)	Correlations, hierarchical regression	Grit was positively related to college grades for Black males. Background traits, academic factors, and grit explained 24% of the variance in Black male's college grades. Grittier Black males earned higher grades than less gritty same-race male peers, even after controlling for differences in age, year in school, engagement activities, degree aspirations, and prior achievement. Grit was a positive predictor of Black males' grades in college, affecting grades almost as equally as high school GPA and ACT score.
Yeager, Henderson, Paunesku, Walton, D'Mello, Spitzer & Duckworth (2014)	To investigate the hypothesis that a higher order, self-transcendent purpose for learning in school would promote academic self-regulation on tedious schoolwork.	Cross-sectional web-based survey (Study 1)	<i>N</i> = 1364 seniors in their final semester at one of 17 participating urban public high schools (over 90% of low Socio-Economic Status)	Correlations, ordinary least squares regressions	A self-transcendent purpose for learning predicted greater grit, personal meaningfulness of schoolwork and academic self-control. A self-oriented, intrinsic motive for learning was a significantly weaker predictor of reported grit compared to a purpose for learning,

## Continued

Wolters & Hussain (2015)	To investigate the relationship between grit and students' self-regulated learning and academic achievement	Cross-sectional study	N = 213 university students (88% female; 29% Hispanic, 21% African-American)	Correlation, multiple regressions.	Grit-PE was a predictor for all indicators of SRL ( <i>value, self-efficacy, cognitive, metacognitive, motivational, time and study environment management strategies, and procrastination</i> ). Grit-CI was associated only with the latter two facets of SRL. Grit-PE predicted achievement before, but not after, accounting for SRL.
Vela, Lu, Lenz, & Hinojosa (2015)	To examine the extent to which meaning in life, search for meaning in life, hope, and family importance predict Latina/o college students' psychological grit.	Cross-sectional survey	N = 128 undergraduate students from the Hispanic Serving Institution; 59% females; 56% Latino/Hispanic, 24% Mexican American; 41% second generation, 12% first-generation.	Multiple regression	Hope was the strongest positive predictor of student grit. Search for meaning in life was a significant negative predictor of grit. Non-significant findings were detected for scores related to subjective happiness and perceptions of family importance.
Bowman, Hill, Denson & Bronkema (2015)	To examine the relationships between grit dimensions and various student outcomes.	Cross-sectional online surveys	<p><b>Study 1</b> N = 417 Bowling Green State University undergraduate students (76% female)</p> <p><b>Study 2</b> N = 2,027 students: n = 1,089 University of Wisconsin at La Crosse students (72% females) and n = 938 BGSU students (76% females)</p>	Correlation, multiple regression, ordinary least squares regression, ordinal logit regression, t-tests.  Correlations, ordinary least squares regression, ordinal logit regression, blocked hierarchical regression.	Both grit subscales were associated with a lower expectation of changing majors, and only Grit-CI was related to less intent to change careers. Grit-PE predicted greater academic adjustment, GPA, sense of belonging, satisfaction, and intent to persist in college, compared to Grit-CI  Grit-PE was positively associated with faculty-student interaction, college satisfaction, and college GPA in both samples. Grit-CI was negatively related to intent to change careers in both samples, and to intent to change majors at UWL. Regression coefficients predicting all continuous outcomes were significantly greater for Grit-PE than for Grit-CI.
Dixon, Worrell, Olszewski-Kubilius, & Subotnik (2016)	To examine the contributions of three psychosocial variables—grit, hope and academic self-efficacy, —to the prediction of academic achievement above and beyond the contributions of demographic variables and perceived ability.	Cross-sectional study	N = 609 academically talented adolescent students (42.3% male; 62.3% Asian Americans)	CFA, hierarchical regression analysis	Grit contributed the least amount of variance to both perceived ability and academic achievement. Hope and academic self-efficacy were significant predictors of perceived ability, but grit did not contribute. Grit-PE had a positive moderate association with academic achievement, with Grit-CI manifesting similar but negative association.
Dumfart & Neubauer (2016)	To investigate whether non-cognitive traits have incremental validity over intelligence and conscientiousness in terms of individual school achievement.	Cross-sectional study	N = 361 secondary high school students in Austria (171 girls, 190 boys)	CFA, bivariate correlations, hierarchical regressions	Grit weakly to moderately positively correlated with GPA, science, and languages score. The incremental contribution of grit to the prediction of GPA, science or languages over and above intelligence and conscientiousness was not significant.

## Continued

Weisskirch (2016)	To investigate whether grit, self-esteem, learning strategies, and attitudes toward lifelong learning predict estimated and achieved grades in a particular course, and explore whether self-esteem, learning strategies, and attitudes toward lifelong learning predict grit.	Cross-sectional survey	<i>N</i> = 302 undergraduate students; 82% female; 42% Latino	Correlation, multiple regressions, ANOVA	Grit-PE positively correlated with estimated grade & achieved grade. Grit-PE and Grit-CI positively correlated with estimated grade, but only Grit-PE significantly predicted it. Self-esteem, attitudes toward lifelong learning, and GSL were predictors of Grit-PE. Self-esteem and general strategies for learning were predictors of grit. Latinos had higher Grit-CI and GSL score than others.
West, Kraft, Finn, Martin, Duckworth, Gabrieli & Gabrieli (2016)	To examine relationships between non-cognitive skills of charter and district school students and their academic achievement.	Cross-sectional self-report survey, with administrative and longitudinal data	<i>N</i> = 1368 8 <sup>th</sup> graders from 32 public schools in Boston	Correlation, Two Stage Least Squares (2SLS) regression	Grit was positively related to attendance, behavior, math and ELA test-score gains between 4 <sup>th</sup> and 8 <sup>th</sup> grade at the student level. Grit was not related to test-score gains at the school level.
Tucker-Drob, Briley, Engelhardt, Mann, & Harden, (2016)	To investigate how a variety of character variables (among which grit) relate with one another, with fluid intelligence, academic achievement and verbal knowledge.	Cross-sectional survey	<i>N</i> = 811, twins and triplets from the Texas Twin Project, 3 <sup>rd</sup> -8 <sup>th</sup> grade; 51.2% female; 61.4% non-Hispanic White; (380 twin pairs and 51 pairs from triplet sets): 141 monozygotic (MZ) pairs, 147 same-sex dizygotic (DZ) pairs, and 143 opposite sex DZ pairs	Correlations, regressions, CFA, EFA, SEM, Cholesky decomposition	Character and BFI showed small associations with fluid intelligence, and larger associations with knowledge/achievement. Character was significantly correlated with knowledge/achievement outcomes in 89% of the pairs. <b>Grit loaded on "Conscientiousness" as one latent factor</b> , which was found to be 57% heritable. After controlling for fluid intelligence, the genetic component of character, but not the environmental, was still associated with variation in the knowledge/ achievement factor.
Farruggia, Han, Watson, Moss & Bottoms (2016).	To explore what non-cognitive factors predict college success, and whether the associations between these factors and student success vary as a function of race or ethnicity.	Cross-sectional survey	<i>N</i> = 1603 public university 1 <sup>st</sup> year students. (53% female; 28% Latino; 28% European American, 26% Asian/Pacific islander; 49% 2 <sup>nd</sup> generation immigrant students; father of 70% not born in the US)	Multigroup CFA, correlation, SEM	Grit-PE showed positive correlations with: academic self-efficacy, GPA, motivation, time management, and sense of belonging. Grit-PE significantly predicted academic achievement, and consequently, first-to-second year retention. Asian American students reported the lowest levels of grit. Asian American and White students were more successful academically than Latino and African American students.
Rimfeld, Kovas, Dale & Plomin (2016)	To investigate the genetic and environmental origins of individual differences in Grit within a large representative U.K. adolescent sample, and explore the power of Grit to predict academic achievement beyond the Big Five personality traits and the extent to which this prediction is mediated by genetic and environmental factors.	Genetically sensitive re-search design	<i>N</i> = 4642 participants at age 16 (2,321 twin pairs) from the UK Twins Early Development Study (TEDS) sample (883 monozygotic (MZ) pairs, 761 same-sex dizygotic (DZ) twin pairs and 677 opposite-sex DZ twin pairs)	Factor analysis, ANOVAs, correlation, hierarchical multiple regression, twin method (ACE), bivariate genetic analysis	Grit-PE and Conscientiousness correlated positively but weakly with GCSE, while Grit-CI correlated very weakly with GCSE. Grit-PE significantly predicted GCSE independently of Grit-CI, but not vice versa. Together, the two Grit dimensions explained only 2% of the variance in GCSE grades. Grit added little phenotypically/genetically to the prediction of academic achievement beyond traditional personality factors, especially conscientiousness.



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O'Neal, Espino, Goldthrite, Morin, Weston, Hernandez & Fuhrmann (2016)	To explore stress, depression, grit, and academic success among non-citizen and citizen Latina/o first-generation College students.	Cross-sectional study	<i>N</i> = 264 first generation college students (180 citizen, 84 non-citizens, 59.5% undocumented and 40.5% legal U.S. residents or with temporary protected status). [ <i>n</i> = 47 interviewed (18 males and 29 females, 21 non-citizens and 26 citizens, <i>M</i> age = 21)]	Mixed methods: Correlations and regressions. Thematic content analysis	Grit only had a significant relation with achievement for non-citizens and was negatively correlated with depression for all participants. Depression was higher at lower levels of grit for non-citizens **** All participants exhibited grit by working hard to achieve their goals, and proving others wrong. Part of their grit stemmed from their families and communities. Non-citizens employed grit to finance higher education, and succeed in college.
Hill, Burrow & Bronk (2016)	To explore the role of purpose and positive affect in predicting levels of grit in students, and examine the longitudinal relationships between these three constructs.	Cross-sectional survey	<i>N</i> = 337 seven Canadian undergraduate from Canadian university; 1st or 2 <sup>nd</sup> year of school (82%); 75% female, 62% White	Correlations, multiple regression	When controlling for all Big Five traits, partial correlations with grit were significant for both purpose and positive affect. These variables were unique and independent predictors of grit.
		Longitudinal survey	<i>N</i> = 165 undergraduates (63.6% female; 93.3% white; 73.3 % participated again 3 months later.	Correlations, regressions, cross-lagged model	Grit was correlated positively with purpose commitment and positive affect, which were unique positive predictors of grit in T1, but only purpose predicted T2 grit.
Hodge, Wright, & Bennett, (2017)	To investigate the role of grit in improving academic outcomes (academic engagement and productivity) within the university setting, and explore whether demographic variables moderate the relationship between grit and academic success.	Cross sectional electronic survey	<i>N</i> = 395 Australian university students (87% females).	Hierarchical regression, SEM, mediation analysis.	Both Grit-PE and Grit-CI correlated positively with academic engagement and productivity. Being the first in family to attend university was weakly associated with an increased level of Grit-PE. Grit-PE, but not Grit-CI had a small significant contribution to the prediction of academic productivity. Both subscale scores significantly predicted engagement, but Grit-PE contributed more than twice in explaining engagement compared to Grit-CI.
Hwang, Lim, & Ha (2017)	To examined the structural relationship between age, grit, conscientiousness, self-control, and academic success, and explore whether grit mediates personality and academic maladjustment.	Cross-sectional survey	<i>N</i> = 509 female students from an Open University in South Korea.	Correlations, CFA, SEM	Grit-PE was negatively correlated with academic maladjustment, and had a positive indirect effect on GPA scores. Grit-PE was a better predictor of academic adjustment and GPA than Grit-CI. Conscientiousness and self-control had negative effects on academic maladjustment through Grit-PE.
Lee & Sohn (2017)	To examine the effects of grit and deliberate practice on academic achievement and career attitudes in a Korean context	Cross-sectional electronic survey	<i>N</i> = 253 students taking a psychology class at a college in Seoul, South Korea (53.4% female).	Correlation, hierarchical multiple regression	Grit was associated with higher grades, and this relationship was mediated by deliberate practice. Grit was a significant predictor of career preparation behavior, when academic year and Big Five personality traits were controlled for.

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Lin & Chang (2017)	To explore the relationship between grit and academic performance and satisfaction, and to examine whether personality, family influence, and democratic parenting style predict grit.	Cross-sectional survey	<i>N</i> = 1504 10 <sup>th</sup> grade Taiwanese students from a private comprehensive high school	Multiple linear regression	Grittier students tended to self-report higher academic performance and increased academic satisfaction. High performers scored higher on Grit-PE and Grit-CI. Grit was significantly predicted by family influence and the Big Five personality traits apart from Extraversion. Conscientiousness was the most powerful predictor.
Muenks, Wigfield, Yang, & O'Neal (2017)	To examine (a) the factor structure of grit, (b) its relation to similar constructs, and (c) its predictive power for end-of-semester course grades.	Cross-sectional survey	Sample 1: <i>N</i> = 203 high school juniors (50.7% female, 61.6% White). Sample 2: <i>N</i> = 336 undergraduate students (74.4% female, 58.1% White) from a mid-Atlantic university.	Multidimensional item response theory, multiple regression analyses	a) Bifactor model of grit as a single latent construct with 2 subscales (Grit-PE and Grit-CI) fit best in college sample, whereas the 2-correlated model fit best in high school sample. b) For both samples Grit-PE predicted grades more strongly than Grit-CI. c) High school Grit-PE overlapped most with self-control, cognitive self-regulation, and behavioral engagement. College Grit-PE overlapped with self-control and conscientiousness, while Grit-CI overlapped more with cognitive self-regulation, effort regulation, behavioral engagement, and behavioral disaffection.
Oriol, Miranda, Oyanedel, & Torres (2017)	To observe the effect of grit and self-control on academic self-efficacy and satisfaction with school.	Cross-sectional survey	<i>N</i> = 5681 primary school students (50.1% males), and <i>N</i> = 10,017 secondary school students (50.5% females) from Lima, Peru.	SEM	Grit is related to academic-self efficacy at both educational levels, but only with satisfaction with school at secondary school level.
Pate, Payakachat, Harrell, Pate, Caldwell, & Franks (2017)	To explore the association of grit with academic performance measures in pharmacy students.	Cross-sectional, electronic survey	<i>N</i> = 724 student pharmacists (69% female, 85% White) from three US public Colleges of Pharmacy	Multinomial Logistic Regression	Grit-total score was an independent predictor of high academic performance. High performing students reported high scores in both Grit subscales (CI and PE). Low performers showed lower scores in both Grit subscales.
Park, Tsukayama, Goodwin, Patrick, & Duckworth (2017)	To explore whether interpersonal character would predict positive peer relations, intrapersonal character would predict higher report card grades, and intellectual character would predict active class participation.	Prospective, longitudinal study	<b>Study 1</b> <i>N</i> = 491 5 <sup>th</sup> -8 <sup>th</sup> grade students (55% female, 65% Hispanic) from 2 middle schools rated by teachers	EFA, longitudinal multiple regression	Intrapersonal character (grit and academic self-control) predicted both class participation and academic achievement Character strengths (interpersonal, intellectual, and intrapersonal) are highly related, but are distinct enough to differentially predict outcomes one year later.
	To confirm the tripartite taxonomy of character based on student reports.	prospective, longitudinal study	<b>Study 2</b> <i>N</i> = 420 6 <sup>th</sup> -8 <sup>th</sup> grade students (49% female; 86% Hispanic)	CFA, longitudinal multiple regression	Each of the three character factors were positively correlated with GPA at the end of school year over and above demographic covariates and cognitive ability. Only intrapersonal character remained a significant predictor of growth in GPA.
	To examine the predictive power of each character factor after accounting for baseline outcomes and explore convergence between character factors and Big Five personality dimensions.	prospective, longitudinal study	<b>Study 3</b> <i>N</i> = 1,507 4 <sup>th</sup> through 8 <sup>th</sup> grade students (52% female; 37% were Hispanic)	Simultaneous regression, multiple regression	Students high in intrapersonal character earned higher grades. Intrapersonal character was the strongest correlate of Conscientiousness.

## Continued

Flanagan & Einarson (2017)	To examine the interrelationships among gender, grit, and math confidence for student performance on a pre-post quantitative skills assessment and overall performance in an undergraduate University course.	Pre-post study design	<i>N</i> = 169 students enrolled in a 2 <sup>nd</sup> year introductory ecology course at a University in Canada.	Two-sample Fisher-Pitman Permutation tests, Multiple linear Regression, Correlation.	Grit was positively associated with exam scores in the course. The effect of grit on performance was mediated by math confidence (as math confidence increased, the positive effect of grit decreased).
Dixon, Roberson, & Worrell (2017)	To examine whether four psychosocial variables (grit, growth mindset, ethnic identity, and other group orientation) correlate, predict, and contribute incremental variance to academic achievement beyond socioeconomic status (SES) and other demographic variables	Cross-sectional survey	<i>N</i> = 105 (59% female) high achieving African American high school students (cumulative GPA > 3.0)	Bivariate correlation, hierarchical multiple regression.	Grit-PE and Grit-CI showed non-significant correlations with academic achievement and did not comprise significant predictors.
Akos & Kretchmar (2017)	To explore the predictive validity of self-reported and informant-reported grit on college outcomes.	Cross-sectional survey	<i>N</i> = 209 first-year undergraduate University students (72% women, 68% Caucasian)	Hierarchical multiple regression, logistic regression, ICC	Grit total scores significantly predicted GPA. Self-report grit total score inversely predicted change in major. Only Grit-PE predicted GPA compared to Grit-CI. Lower grit scores were linked with a higher likelihood to change majors, with only Grit-CI being a significant predictor.

Note: *Acronyms/Abbreviations*: CFA = Confirmatory Factor Analysis, EFA = Exploratory factor analysis, GCSE = U.K.-wide national exam administered at the end of compulsory schooling, Grit-PE = the “perseverance of effort” dimension of grit, Grit-CI = the “consistency of interest” dimension of grit, GPA = Grade Point Average, ICC = Intraclass Correlation, SEM = Structural Equation Modelling.

Grit considered as a dimension of character also provided consistent results. Tucker-Drob et al. (2016) found that character measures (among which grit) were significantly correlated with the achievement and knowledge outcomes in 89% of twin/triplet pairs of 3<sup>rd</sup> to 8<sup>th</sup> grade students. Park et al. (2017) explored a tripartite taxonomy of character (interpersonal, intellectual and intrapersonal) in three related studies on 4th to 8th graders. Results showed that only intrapersonal character (which includes grit) was related to higher grades (study 3) and was a significantly predicted class participation and academic achievement (study 1) as well as higher student GPA (study 2).

Strayhorn (2014) who explored the role of grit in the academic success of Black male collegians’ at predominantly White institutions, concluded that grittier Black males achieved higher grades than their less gritty same-race male peers, and that grit was a positive predictor of college grades, explaining almost as equal variance as high school GPA and ACT score. Similarly, Akos and Kretchmar (2017) found that self-report grit total score significantly predicted GPA in undergraduate students, and Pate et al. (2017) found that grit-total score was an independent predictor of high academic performance in a sample of student pharmacists in the US. Grittier Taiwanese students tended to self-report higher academic performance and increased academic satisfaction in the study by Lin &

Chang (2017), while grit was significantly positively associated with academic achievement only for non-citizen Latino first-generation college students in the study by O'Neal et al. (2016). In two studies, the positive relationship between grit and academic performance was mediated by deliberate practice in Korean students (Lee & Sohn, 2017) and by math confidence (for students with lower math confidence the positive effect of grit was stronger) in university students in Canada (Flanagan & Einarson, 2017).

Four studies explored the predictive capacity of grit beyond personality and intelligence in terms of academic performance or achievement, and three in terms of retention in education. Grit predicted unique variance in performance on the Academic Diligence Task (as a behavioral measure of academic diligence, focused on time spent on the task or on productivity of problems solved) in high school seniors, after controlling for agreeableness (Galla et al., 2014). Complementary were the results of the study by Dumfart and Neubauer (2016), who investigated whether non-cognitive traits have incremental predictive capacity over intelligence and conscientiousness in terms of school achievement. Grit correlated moderately with academic achievement criteria, such as GPA, science and language scores. However, only together with other variables, rather than alone, could it account for almost half the variance in adolescent school achievement. Similarly, grit added little phenotypically or genetically to the prediction of academic achievement beyond traditional personality factors, especially conscientiousness in a sample of twins (Rimfeld et al., 2016). Even though grit correlated positively with school satisfaction, school recognition and decreased rule violation, it did not correlate with GPA and academic honors; neither did it explain additional variance in any school outcome compared to conscientiousness in the study by Ivcevic and Brackett (2014).

Interesting was the finding that grit is linked with retention in education. Eskreis-Winkler et al. (2014) found that grit was positively correlated with school motivation and academic conscientiousness, and it remained a significant predictor of graduation, as a measure of retention. Grit predicted retention over and beyond established context-specific predictors of retention (e.g., intelligence) and demographic variables (Eskreis-Winkler et al., 2014). In the aforementioned study by Lee and Sohn (2017), grit significantly predicted career preparation behavior and major-career relatedness when Big Five personality traits were controlled for. Complementary were the findings by Akos and Kretchmar (2017) where self-report grit total score inversely predicted change in major in a sample of first-year undergraduate students.

Grit was also related to a variety of educational outcomes apart from academic performance. In the study by West et al. (2016) which examined relationships between non-cognitive skills and academic achievement in charter and district school students, grit was positively related with math and ELA test scores, as well as attendance and behavior at the student level. Grit was also positively related to academic-self efficacy at primary and secondary school level, but only with satisfaction with school at secondary school level (Oriol et al., 2017).

Overall, results regarding the first research question are homogeneous. Grit is linked with various positive educational outcomes. It is positively correlated mainly with academic performance and achievement, although correlations do not reach strength. However, rarely does it show incremental predictive validity over other predictors (such as personality) regarding achievement, but it has satisfactory predictive capacity regarding retention in education.

**The two facets of Grit and educational outcomes.** Thirteen studies explored grit in terms of its two facets and found that they associate differently with educational outcomes. In the reviewed studies there was no consensus regarding the way in which the two facets of grit correlate with academic performance. Yet, results on the variables predicted by each of the two facets of grit were quite consistent.

High performers reported higher Grit-PE and Grit-CI scores compared to average or low performing Taiwanese students (Lin & Chang, 2017) and student pharmacists in the US (Pate et al., 2017). Both Grit-PE and Grit-CI showed weak correlations with the GCSE of twin teenage students in the UK (Rimfeld et al., 2016), positive correlations with estimated grade (Weisskirch, 2016) as well as academic engagement and productivity (Hodge et al., 2017) in undergraduate students, and were associated with a lower expectation of changing majors (Bowman et al., 2015). Dixson et al. (2016) who examined talented students found that Grit-PE positively, but moderately, correlated with academic achievement, whereas Grit-CI displayed a same strength negative correlation. However, Dixson et al. (2017) found that Grit-PE and Grit CI showed non-significant correlations with academic achievement of African American high school students, and neither comprised a significant predictor.

A number of studies found that each facet of grit is associated with different variables. Grit-PE was negatively correlated with academic maladjustment (Hwang et al., 2017) and positively associated with GPA (Bowman et al., 2015; Farruggia et al., 2016), achieved grade (Weisskirch, 2016), motivation, academic self-efficacy, and time management (Farruggia et al., 2016). It also correlated positively with college satisfaction, faculty-student interaction, and co-curricular engagement, while Grit-CI was related to less intent to change careers (Bowman et al., 2015), procrastination, time and study environment management strategies (Wolters & Hussain, 2015). Another interesting finding was that being the first family member to attend university was linked to higher levels of student Grit-PE (Hodge et al., 2017).

Generally, Grit-PE was found to be a more powerful predictor of academic performance and retention compared to Grit-CI. In the study by Hodge et al. (2017) in Australian university students, Grit-PE, but not Grit-CI, showed a small significant contribution to the prediction of academic productivity measured in perceived academic performance. In the same study, both Grit-PE and Grit-CI significantly predicted academic engagement, but Grit-PE contributed more than twice compared to Grit-CI. Similar results come from the following studies. Only Grit-PE predicted GPA compared to Grit-CI in undergraduate

university students (Akos & Kretchmar, 2017), grades in both high school and college student samples (Muenks et al., 2017), GCSE in high school students in the UK (Rimfeld et al., 2016), as well as higher GPA, greater academic adjustment, and intent to persist in college (Bowman et al., 2015). Wolters and Husain (2015) found that Grit-PE predicted academic achievement as well as all self-regulated learning indicators (such as self-efficacy, cognitive, metacognitive, motivational, time and study environment management strategies), and was the only significant predictor of estimated grade reported by undergraduate students in the study by Weisskirch, 2016). Perseverance significantly predicted academic achievement and consequently retention, reflected in progression to the next year of studies (Farruggia et al., 2016). Hwang et al. (2017) found that only Grit-PE had a positive indirect effect on GPA scores and it mediated the negative relationship that conscientiousness and self-control had with academic maladjustment. The reviewed studies only showed that Grit-CI was a significant negative predictor of the likelihood of undergraduate University students to change majors (Akos & Kretchmar, 2017).

In conclusion, findings agree that perseverance of effort and consistency of interest function as two separate variables, with Grit-PE being a stronger positive predictor of academic performance compared to Grit CI.

**Variables predicting grit in education.** The reviewed studies that investigated the factors that predict grit in education were seven. Four studies revealed that factors related to hope, meaning and connection predict grit. Hill et al. (2016) found that purpose in life and positive affect were unique positive predictors of students' grit. Vela et al. (2015) found hope to be the strongest positive predictor of grit in Latino students, and search for meaning the strongest negative one, while first generation Latino students' families and communities were found to play an important role in grit (O'Neal et al., 2016). Lin and Chang (2017) also found that perceptions of family influence and Big Five personality traits (apart from extraversion) were significant predictors of Taiwanese students' grit, with conscientiousness being the strongest one.

Factors associated with learning also emerged as predictors of grit in three studies. Akin and Arslan (2014) found that learning (mastery) approach goal orientation was the strongest positive predictor of grit, while learning-avoidance and performance approach/avoidance goal orientations significantly negatively predicted grit. Findings by Yeager et al. (2014) revealed that a self-transcendent purpose for learning predicted greater personal meaningfulness of schoolwork, grit, academic self-control, and performance on boring math problems of the Academic Diligence Task, and increased both the attempt towards deep learning from such a task, and course grades for all students, but especially for low-performers. Additionally, a self-oriented, intrinsic motive for learning was a significantly weaker predictor of reported grit compared to a purpose for learning. Finally, Weisskirch (2016) found that self-esteem and general strategies for learning predicted both facets of grit, while attitudes toward lifelong learning also predicted Grit-PE.

In summary, the few studies that have investigated predictors of grit in education have shown that both positive psychology variables such as hope, meaning and connection, and learning factors, such as learning approach-avoidance goal orientation and a self-transcendent purpose for learning, predict grit.

#### 4. Discussion

The purpose of this systematic review was to investigate the role that grit plays in education and explore its outcomes and its antecedents. Twenty out of the twenty-nine reviewed articles were published in 2016 and 2017, indicating the increasing interest in this field of research. The review provided a range of emerging findings from quantitative studies on the role that grit plays in education.

Consistent with previous studies (Duckworth et al., 2007), grit as an overall score was positively associated with various educational outcomes related to academic achievement and retention in education. Grit was positively associated with measures of academic performance, such as GPA, GCSE, ACT scores, science and language scores, as well as with more behavioral outcomes, such as school motivation, attendance and behavior, academic conscientiousness, satisfaction with school/college, decreased rule violation, and performance on the ADT task (e.g. Bowman et al., 2015; Farruggia et al., 2016). It also displayed positive associations with mastery approach goal orientation (Akin & Arslan, 2014). However, in line with the findings of Credé et al. (2016), correlations between grit and most educational outcomes were weak to moderate in the majority of studies. This might be explained by the fact that there could be other factors mediating this relationship, such as math confidence (Flanagan & Einarson, 2017) or deliberate practice (Lee & Sohn, 2017).

Contrary to previous assumptions, only a few studies showed that grit had incremental predictive validity over other predictors regarding performance and retention (e.g. Eskreis-Winkler et al., 2014; Strayhorn, 2014). When variables such as intelligence or personality traits, and more specifically conscientiousness, were explored together with grit, the latter lost its predictive power (Dumfart & Neubauer, 2016). This indicates that maybe the construct is not operationalized satisfactorily or that grit is part of or overlaps significantly with the conscientiousness personality dimension (Credé et al., 2016). Therefore, there is a need for further studies to help better conceptualize grit and differentiate it from other, related, constructs.

Studies confirming the two-factor structure of grit revealed that “perseverance of effort” was a stronger predictor of academic performance compared to “consistency of interest” (e.g. Bowman et al., 2015; Muenks et al., 2017; Wolters & Hussain, 2015). Perseverance of effort was associated with self-regulated learning strategies, academic engagement and performance in the university (Hodge et al., 2017), whereas consistency of interest was associated with decreased likelihood of university students to change majors (Akos & Kretchmar, 2017) and less intent to change careers (Bowman et al., 2015). This indicates that a sus-

tained interest in a specific area is more linked to a long-term goal, since selection of a major is intertwined with career intention and they both are future-oriented. The findings that perseverance of effort and consistency of interest function as two separate variables suggest that the construct of grit needs further research, since it is not clear whether it is better to be conceptualized as a unidimensional construct, or as two separate variables.

Perseverance of effort was found to correlate strongly or overlap with conscientiousness in many studies (e.g. Dumfart & Neubauer, 2016; Ivcevic & Brackett, 2014). This may indicate first of all that the two dimensions of grit behave differently, and that only perseverance may be closer to grit as a construct. Rimfeld et al. (2016) argued that the etiology of grit is highly similar to other personality traits such as conscientiousness, by sharing a genetic instead of environmental background, which accounts for associations between character and academic achievement, a finding in agreement with the study of Tucker-Drob et al. (2016). These findings indicate that the current measurement of grit with the Grit Scale does not differentiate the construct considerably from conscientiousness, and does not raise its predictive validity over and above factors such as personality, supporting already contradictory claims regarding grit and conscientiousness (Abuhassan & Bates, 2015; Perez, 2015).

Although there is scarce research on predictors of grit in education, the reviewed studies revealed that grit can be predicted by two main factors. The first are concerned with learning, such as mastery orientation goals (Akin & Arslan, 2014) or a self-transcendent model of learning (Yeager et al., 2014). The second group of factors has to do with positive psychology variables intertwined with connection and purpose, such as hope, purpose in life and commitment, positive affect (Hill et al, 2016; Vela et al., 2015), and perceived family influence, conceptualized as psychological and social support (Lin & Chang, 2017). As the mixed methods study by O'neal et al. (2016) revealed, college students' grit stems from their relationships with family and community. These findings together suggest that strengthening family and community bonds, improving communication and relationships between family, community, schools and learners as well as fostering a positive and supporting school climate could enhance grit (or even perceptions of grit), and consequently successful outcomes in education (Duckworth, & Yeager, 2015). Attention should be given especially to ethnic minority groups, where fostering grit could function as a means towards educational success, where learners should be supported to sustain efforts to stay engaged with their studies, despite perceived social inequities or limited access to resources, and regardless of talent. Hence, it seems that more qualitative studies are essential to reach depth of knowledge regarding the antecedents of grit that play an important role in education.

#### 4.1. Strengths and Limitations

The current systematic review comprises the first attempt to gain an insight into the antecedents and outcomes of grit in education. Even though literature on



this field is still at its infancy, we managed to spot twenty nine journal articles that provided valuable information on the topic. Its importance lies in the fact that it unveiled a number of factors that can predict grit. Hence, it provided the first step towards a more in depth exploration of the processes and characteristics that underlie grit and keep individuals going towards pursuing their goals.

A number of limitations of this review need to be addressed though. First of all, selection of studies entails two drawbacks. The emerging interest in the role of grit in education was manifest in unpublished research papers, such as doctoral dissertations, and working papers that were not included in the review due to rigorous inclusion and exclusion criteria. Furthermore, the majority of studies selected used self-report scales and questionnaires, amongst which the Grit Scale, which might have biased the selection process, therefore, restricting generalizability of findings. Specifically, the Grit Scale is a self-report questionnaire that has received much criticism not only by researchers but also from its developers. Duckworth (2007) admits that the scale is susceptible to social desirability bias, entails retrospective reflection since participants have to respond to items by thinking of their usual past behavior, and finally, does not take into consideration situational variables that may affect successful performance (Duckworth et al., 2007; Duckworth, & Yeager, 2015). It seems to be a measure that identifies and indicates individual differences, ignoring environmental and social influences to success. All these, although beyond the scope of this review, raise many issues about whether research on grit is directed to learners of the same level tested against the same outcome measures, or to individuals who belong to minorities, have access to limited opportunities, and may be vulnerable to discrimination due to exam performance. As Shechtman, DeBarger, Dornsife, Rosier and Yarnall (2013) claim, individuals are at risk of being accused of poor performance due to lack of grit, instead of lack of critical support and opportunities in their educational environment. This last point could be one new insight into the measurement of grit, which is linked with the antecedents of the construct as well.

Moreover, the review was vulnerable to sample bias. Grit was found to predict performance in some samples but not in others, indicating that such new constructs should be assessed in a wider range of samples before assuming generalization (Dixson et al., 2016). Some studies aimed at specific samples (talented students, particular schools, students with high GPAs) and the majority of studies used samples where females outnumbered males. Furthermore, students from ethnic minorities comprised a large proportion of the samples studied. All these factors raise important ethnic group, cultural and gender issues. Ethnic minority students may carry the stigma or stereotype and may put maximum effort to achieve their academic goals, hence scoring higher in self-reports of grit (e.g. Strayhorn, 2014; Weisskirch, 2016). Empirical evidence suggests that women attribute academic success to effort and are more motivated by academic rewards, whereas men link their success to their ability (Lindo, Sanders, & Oreopoulos, 2010), so gender differences in grit are yet to be further explored.

Additionally, there were scarce studies that explored long-term goals, which is the actual object of reference of the grit concept according to Duckworth et al. (2007). Most of the studies used cross-sectional designs, addressing outcomes within a small time frame rather than investigating grit for long-term goals. Prospective studies investigated participants over short periods of time, most studies focused on standardized test scores rather than actual learning processes, and no study explored whether goals were meaningful to participants instead of perceived as merely an endpoint in the educational process.

## 4.2. Implications and Avenues for Future Research

Findings indicate that there is ground for research and practice regarding grit and its antecedents in education. It seems that individual factors are not the only ones that contribute to the occurrence of grit; situational and environmental factors also play an important role. Hence, by understanding the factors that can make individuals grittier, researchers and educators can work on specific programs and projects to enhance grit, not only in learners but in the entire educational community. Targeted actions to nurture a positive educational environment with support networks and strong relationships among members could offer a sense of belonging and foster hope in an effort to keep individuals' efforts focused on their long-term educational goals.

Future research should consider a broad range of issues. First of all, updated or supplementary instruments need to be developed to measure grit more accurately, and clarify its structure and its relation to conscientiousness. More focus should be directed on the "perseverance of effort" as a distinct facet and its role in educational outcomes. This will facilitate a deeper understanding and will allow for the development of adequate interventions, such as the employment of character strengths to nurture and strengthen grit (Perez, 2015). Studies should also use repeated measurements and collect scores on exams across time instead of only relying on final exam scores to measure performance in educational contexts, in an effort to assess learning and acquired knowledge.

Additionally, longitudinal studies should explore whether its two facets remain positively correlated in the face of long-term adversity, situational changes or personal goal modification. It could also be investigated whether grit remains the same across all educational settings, e.g. whether individuals report the same level of grit in school or in computer or foreign language education, and whether it is retained after education completion, e.g. in relevant work environments. It would also be interesting to investigate grit of individuals who choose to pursue a career in the Academia, e.g. doctoral students and researchers. Grit should be investigated in separate groups of students, since different levels of grit may appear in talented students, ethnic minority students, students of different educational levels, or even students that come from collectivistic and individualistic cultures. Additionally, grit could be explored in cases of learning disability as well as in terms of setting variation, e.g. differences in grit between learners of regular versus Montessori school settings, or even distance learners. Finally,

qualitative studies could help us find out how grit is perceived by different cultures and ethnic groups, especially in multicultural classes, and explore in more depth whether group dynamics and positive relationships in the educational context may foster grit.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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