



# An In-depth Review of Conscientiousness and Educational Issues

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## Abstract

Why does conscientiousness matter for education? How is conscientiousness conceptualized in the field of research on education? How do socio-emotional (SE) skills relate to conscientiousness? In an effort to help answer these questions, we review the current research on conscientiousness in education. Specifically, we examine (1) how conscientiousness is defined, (2) the assessment of conscientiousness, (3) the relation between conscientiousness and educational outcomes, (4) whether too much conscientiousness may be a bad thing, (5) the relation between conscientiousness and conceptually related educational constructs, (6) the changeability of conscientiousness and the importance of that fact to education, and (7) the challenges of assessing conscientiousness across cultures.

**Keywords** Conscientiousness · SE skills · Personality · Education

It is clear that children, adolescents, and adults alike need more than technical knowledge to function optimally when trying to meet the challenges of the world, such as working effectively in groups, understanding how to achieve one's goals, and contributing to the social fabric of society. The realization that educational systems are also tasked with teaching more than cognitive and informational skills highlights the importance of what have been loosely described as social and emotional skills (SE skills; Duckworth & Yeager, 2015; Soto et al., 2021a, 2021b). With this realization, many different types of social and emotional skills have been cataloged and put

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forward as critical to students' eventual success. Of these SE skills, those from the domain associated with self-regulation or conscientiousness appear to be some of the most important skills to foster and develop for success in adulthood (Boekarts et al., 2000; Dumfart & Neubauer, 2016; Eisenberg et al., 2010; Poropat, 2009). For the current review, we focus on conscientiousness, which is one of the strongest psychological predictors of educational outcomes and rivals some of the other established predictors of educational success (e.g., self-efficacy, McAbee & Oswald, 2013; Richardson et al., 2012; Trapmann et al., 2007; Vedel & Poropat, 2017). Conscientiousness encompasses several overlapping constructs that describe individual differences in the propensity to be self-controlled, responsible to others, hardworking, orderly, and rule abiding (Roberts et al., 2014).

We seek to address key issues about the role of conscientiousness in educational settings. Specifically, we examine (1) how conscientiousness is defined, (2) the assessment of conscientiousness, (3) the relation between conscientiousness and educational outcomes, (4) whether too much conscientiousness may be a bad thing, (5) the relation between conscientiousness and conceptually related educational constructs, (6) the changeability of conscientiousness and the importance of that fact to education, and (7) the challenges of assessing conscientiousness across cultures.

## The Personality Trait of Conscientiousness

Conscientiousness is best thought of as a hierarchical grouping of related higher- and lower-order constructs (Roberts et al., 2014). The overall construct of conscientiousness itself is broad and encompasses narrower traits. We refer to those narrower traits as facets, which themselves can be further divided into the state-level manifestations in behaviors, thoughts, and feelings related to conscientiousness (Möttus et al., 2017).

Research has identified between four and ten facets of conscientiousness with the most commonly identified facets being industriousness, orderliness, responsibility, conventionality, and self-control (Roberts et al., 2014). We outline characteristics for being low and high on the spectrum of the lower-order facets of conscientiousness in Table 1. On the high end, industriousness encompasses the tendencies to work hard, aspire to excellence, and persist in the face of challenges. The lower end of industriousness reflects the tendency to avoid hard work, set easier goals, and prefer a more leisurely approach to life. On the high end, orderliness captures tendencies toward neatness, cleanliness, and planfulness, whereas it captures disorderliness, disorganization, and messiness on the low end of the spectrum. Responsibility captures tendencies to follow through with promises and obligations on the high end of the spectrum, and on the low end, it captures tendencies to be unreliable and break one's promises. At the high end, conventionality describes tendencies to endorse and uphold societal rules and conventions, whereas on the opposite pole, it reflects the tendency to break rules and undermine conventions. Lastly, self-control encompasses tendencies to control and inhibit one's impulses on the high end of the spectrum and tendencies toward impulsiveness, recklessness, and lack of restraint on the low end of the spectrum.

**Table 1** Facets of conscientiousness and characteristics

Facets	Adjectives for high	Adjectives for low
Industriousness	Hard working Aspire to excellence Persistent despite challenges	Avoid hard labor Setting easier goals Preferring a more leisurely approach to life
Orderliness	Neatness Cleanliness Planfulness	Disorderliness Disorganization Messiness
Responsibility	Follow through with promises and obligations	Unreliable and break one's promises
Conventionality	Endorse/uphold societal rules and conventions	Break rules and undermine conventions
Self-control	Control and inhibit one's impulses	Impulsiveness Recklessness Lack of restraint

While a faceted conceptualization of conscientiousness affords researchers the opportunity to pick and choose which aspects to focus on, it also begs the question of what is the shared core of conscientiousness that cuts across these facets. In an exhaustive analysis, Costantini and Perugini (2016) attempted to answer this question. They examined correlations, factor structures, and network structures across a thorough set of conscientiousness measures and found the shared component for all facets was best described as “self-controlled future orientation.” For example, in educational settings, when confronted with a self-regulatory choice (e.g., studying for an exam), conscientiousness entails a consideration of the future consequences of that choice (e.g., getting a good grade). The process of considering one's future calls upon students' ability to control impulses long enough to consider the choice and then plan one's actions out depending on what action is entailed. In the case of proactive aspects of conscientiousness, like industriousness, students would consider the benefit of achieving a goal (e.g., a good grade) and then initiate action to achieve it (completing a homework assignment). In the case of inhibitive aspects of conscientiousness, like self-control, a tempting stimulus (e.g., not studying for a test in order to play video games) as well as the negative consequences of the short-term actions (a bad grade) are weighed. Those with more self-control weigh the negative consequence more heavily and by doing so avoid negative consequences.

We believe the underlying shared component of conscientiousness is an important factor to consider when discussing the correlates of conscientiousness and the role it plays in educational outcomes. Research suggests that narrower facets predict educational performance better than the big five traits (Briley et al., 2014; Paunonen & Ashton, 2001; Seeboth et al., 2018; Stewart et al., 2022). It is not yet clear whether the latent, shared aspect of conscientiousness reflected in “self-controlled future orientation” is the causal factor for educational outcomes, like grade point average (GPA), or whether it is the cognitive, affective, and behavioral components specific to certain facets. Future research testing faceted measures of conscientiousness so as to identify the latent, shared

content as well as the specific variance of each facet would go a long way toward identifying potential causal mechanism for the role of conscientiousness in education.

## Assessing Conscientiousness

Although the most common approach to measure conscientiousness is through the use of self-reports, different methods to measure conscientiousness have been studied in psychology and education (e.g., other report, Duckworth & Yeager, 2015; smartphones, Stachl et al., 2020; chatbot, Sun, 2021). For example, self-reports can be complemented with observer ratings made by knowledgeable friends and family members (Vazire, 2006). Alternatively, researchers can use more “objective” indices, such as experimentally derived measures, or assess constructs with implicit approaches that are thought to be less susceptible to bias. Additionally, new opportunities arise to collect mass amounts of data that could be linked to personality, such as smartphones (Stachl et al., 2020) and narrative data obtained via chatbot (Sun, 2021). For example, using narrative data collected from an interactive AI chatbot, Sun (2021) found correlation between textual-derived conscientiousness correlated at 0.12 with self-reported GPA. Unfortunately, research has called into question the validity of both experimental and implicit measures (Duckworth & Kern, 2011).

Many measures of conscientiousness exist, ranging from broad omnibus inventories that include facets to brief assessments of a few items designed to assess the broad trait. While the choice of which measure depends upon the researcher’s needs and time constraints, we would like to underscore the gains in specificity and reliability when using broad measures. As seen below, some existing measures of conscientiousness do not assess all facets of conscientiousness or weight them equally (see Table 2). The unfortunate result is that measures of conscientiousness cannot be adequately compared with one another. Careful attention to item content of conscientiousness measures is required to adequately compare measures of conscientiousness. Adding to the confusion is that many omnibus measures that include facet measures have names that are specific to the scale, making comparisons across measures difficult.

The most commonly used measure of conscientiousness is the 48-item NEO-PI-R and the shorter 12-item version in the NEO-FFI (Costa & McCrae, 1992). The NEO-PI-R measures six facets, which are labeled as follows: competence (closely related to the facet of industriousness), order (orderliness), dutifulness (responsibility), achievement striving (industriousness), self-discipline (orderliness), and deliberation (self-control). The NEO-FFI was not designed to assess facets, but broadly captures orderliness, industriousness, and responsibility facets (Chapman, 2007). Facets found within the NEO tend to focus on the industriousness and orderliness facets of conscientiousness (Roberts et al., 2005) and thus may not necessarily reflect the best assessment for conscientiousness if one is interested in breadth. Similarly, the Abridged Big Five Circumplex (AB5C, Hofstee et al., 1992) includes nine facets of conscientiousness but does not adequately cover the facets of

**Table 2** Selected measures of conscientiousness

Author	Inventory	Facets measured
Cattell (1945)	16-PF	Rule consciousness, perfectionism
Costa and McCrae (1992)	NEO-PI-R	Competence, orderliness, dutifulness, achievement striving, self-discipline, deliberation
De Young et al. (2007)	Big Five Aspects Scales	Industriousness, orderliness
Green et al. (2016)	Chernyshenko Conscientiousness Scales	industriousness, orderliness, self-control, traditionalism, responsibility, virtue
Gough (1987)	California Psychological Inventory	Responsibility, socialization, self-control, good impression, well-being, achievement via conformance
Hofstee et al. (1992)	AB5C	Conscientiousness, efficiency, dutifulness, purposefulness, organization, cautiousness, rationality, perfectionism, orderliness
Hogan and Hogan (1992)	Hogan Personality Inventory	Moralistic, virtuous, not autonomous, not spontaneous, impulse control, avoids trouble
Jackson (1994)	Jackson Personality Inventory-Revised	Organization, traditional values, responsibility
Jackson et al. (2009)	Behavioral Indicators of Conscientiousness	Avoid work, organization, impulsivity, antisocial, cleanliness, industriousness, laziness, appearance, punctuality, formality
Lee & Ashton (2004)	HEXACO-PI	Organization, prudence, diligence, perfectionism
Perugini and Gallucci (1997)	Hierarchical Multifaceted Five Factor Model	Reliability, meticulousness, recklessness, inaccuracy, superficiality
Soto and John (2017)	BFI-2	Organization, productiveness, responsibility
Tallegen and Waller (2008)	Multidimensional Personality Questionnaire	Control, harm avoidance, traditionalism

conscientiousness discussed above (Roberts et al., 2005). Instead, the AB5C facets mainly assess industriousness and orderliness with a single facet measure designed to tap self-control.

In contrast, the Chernyshenko Conscientiousness Scales consist of six facets with 10 items per facet (CCS; Hill & Roberts, 2011). The CCS contains five of the six most commonly found facets of conscientiousness (orderliness, self-control, responsibility, traditionalism, and industriousness), making it one of the only measures that adequately covers the broad complement of conscientiousness facets. The sixth facet, virtue, assesses the tendency to be responsible members of the community by being honorable and rule abiding. It shares some overlap with the responsibility facet but is broader in scope and concerns issues of right and wrong rather than the tendency to follow through with personal obligations. Subsequent research with the CCS has shown that, with the exception of the responsibility facet, the scales have good reliability and validity. The responsibility facet, while showing sensible patterns of correlations with outcomes, tends to not cohere in factor analyses of the CCS items (Green et al., 2016).

Another facet measure is the 20-item measure from the HEXACO inventory (Lee & Ashton, 2008). In this scale, conscientiousness is measured with four facets: organization (orderliness), diligence (self-control/industriousness), perfectionism (orderliness/industriousness), and prudence (self-control). Finally, the Conscientiousness Adjective Checklist (CAC; Jackson et al., 2009) measures most of the identified facets of conscientiousness including orderliness, industriousness, self-control, and responsibility, conventionality and decisiveness (Roberts et al., 2004).

The most commonly used medium-length measure is the 9-item conscientiousness scale from the Big Five Inventory (BFI, John et al., 1991), which appears to mainly assess the self-control and orderliness components of conscientiousness (Soto & John, 2009). Recently, the BFI2 was introduced and the facet structure of the Big Five and, in particular, a 3-facet form of the conscientiousness domain was specified (Soto & John, 2017). In this revision, the conscientiousness domain now consists of twelve items and measures facets described as organization, productiveness (e.g., industriousness), and responsibility. Other medium-length options include ten- and twenty-item IPIP conscientiousness measures (Goldberg et al., 2006), as well as the 8-item mini-marker scale (Saucier, 1994).

In terms of short measures, two popular measures are the Ten Item Personality Inventory, consisting of just two items (TIPI, Gosling et al., 2003), and the BFI ten, also with a conscientiousness subscale containing two items (Rammstedt et al., 2013). Though longer measures are generally preferable (Credé et al., 2012), short measures such as the TIPI and BFI10 can provide adequate assessment of conscientiousness if one is under extreme time constraints.

Most, if not all, of these self-report scales can be adapted for observer ratings. And while the assumption is often that self-reports and observer reports should converge, which they do, they do not converge at a magnitude that would lead to the conclusion that they are redundant (Vazire, 2010). As both self-reports and observer ratings tend to be valid predictors of the outcomes of conscientiousness, such as achievement (Wagerman & Funder, 2007) and health behaviors

(Lodi-Smith et al., 2010), yet only modestly related, they both tend to predict outcomes independent of one another. This means that researchers can maximize their ability to predict important outcomes if they combine self-reports and observer ratings of conscientiousness.

Prior reviews were optimistic about the potential for experimental and implicit measures of conscientiousness (e.g., Roberts et al., 2014). At the time, however, implicit measures were a mystery as they failed to correlate with self- or observer reports of conscientiousness (e.g., Vianello et al., 2010), a mystery that still remains (Vecchione et al., 2014). The fate of experimental approaches, such as techniques to assess executive functioning and inhibitory control, has been called entirely into question (Eisenberg et al., 2019). Eisenberg et al. found that measures such as stop signal tasks, flanker tasks, or switching tasks failed to converge with self-reports and also failed to predict outcomes as well as self-reports of conscientiousness. Furthermore, these experimental tasks were shown to lack adequate levels of test–retest reliability (Enkavi et al., 2019). While there are links between things like self-reported conscientiousness and smart phone usage (Stachl et al., 2020), the magnitude of the associations is too small to use these more objective indices as proxies for conscientiousness. These results hold strong implications for efforts to measure conscientiousness in more “objective” ways or through mediums like computer games. It is clear that performance measures like these are often measuring a different construct. Moreover, they are most likely doing so at such a narrow and episodic way that they do not currently provide a constructive alternative to self-reports or observer ratings of conscientiousness. Hopefully, with the advent of newer technologies and analytical systems, future researchers will be able to develop and validate objective, performance-based measures of conscientiousness which can be used in conjunction with self-report and observer ratings.

## **What Is the Relation Between Conscientiousness and Educational Outcomes?**

Conscientiousness stands as one of the most frequently studied personality or “non-cognitive” factors in education and psychology and is robustly related to educational outcomes (Mammadov et al., 2021; Poropat, 2009, 2014; Richardson et al., 2012; Vedel, 2014). Cognitive factors include intelligence, problem solving, and decision-making and are factors that affect functions such as attention and memory (Danili & Reid, 2006). In contrast, non-cognitive factors include psychological constructs such as personality traits, social and emotional skills, need for cognition, school interest, achievement goal orientation, and growth mindset (Briley et al., 2014; Duckworth & Yeager, 2015; Hagger & Hamilton, 2019; Morell et al., 2020; Soto et al., 2021a, 2021b; Usher et al., 2019; Zheng et al., 2020). In the following section, we review the literature on conscientiousness and educational outcomes. For the scope of this review, we focus on the most commonly researched educational outcomes (Poropat, 2009), academic

achievement, and attendance and subsequently discuss how conscientiousness combines with motivation in educational settings.

## Conscientiousness and Academic Achievement

Academic achievement stands as an important academic outcome due to its relation to income level (Morrissey et al., 2014) and subjective well-being (Bücker et al., 2018). In this section, we review past research on how well conscientiousness predicts academic achievement and provide a discussion of potential mechanisms that explain why conscientiousness is associated with academic performance across different grade levels. For the scope of this review, we use grades and GPA as measures of academic achievement.

A myriad of empirical studies has demonstrated that conscientiousness is one of the most reliable predictors of scholastic achievement across all grade levels (i.e., primary, secondary, or tertiary; Poropat, 2009). Several meta-analyses highlight that conscientiousness, largely independent of intelligence, positively relates to academic achievement (Mammadov et al., 2021; Poropat, 2009; Richardson et al., 2012). For instance, conscientiousness predicts college GPA over and above SAT scores and high school GPA (Noftle & Robins, 2007). Conscientiousness also independently predicts senior GPA after controlling for freshmen GPA (Wagerman & Funder, 2007). Conscientiousness consistently predicts positive academic performance, regardless of the performance indicators used (e.g., thesis writing, skills training, team projects; Kappe & van der Flier, 2010). Furthermore, research indicates that facets of conscientiousness predict academic achievement as well as conscientiousness measured as a global factor (Paunonen & Ashton, 2001). Another more recent meta-analysis found that conscientiousness added incremental validity over and above cognitive ability in predicting academic achievement across different contexts (Mammadov et al., 2021). Strong predictive validity of grit persists for graduate students enrolled in professional degrees (Lievens et al., 2002) and doctoral programs (Cross, 2014). Taken together, these findings suggest that high conscientiousness is positively related to increased levels of academic achievement (Galla et al., 2019; Lopes et al., 2012; Mammadov et al., 2021; Mondal & Saha, 2017; Parker, 1997; Reilly, 1976).

Conscientiousness is positively associated with academic achievement for students ranging from elementary to graduate school, but there is some evidence of variability across grade levels, albeit mixed in their magnitude. Some research notes a small decline in the relation of conscientiousness and educational achievement with age. Specifically, research examining students' self-reports suggests that students in primary education benefit the most from conscientiousness ( $r=0.28$ ;  $N=3196$ ) compared to students in other academic levels ( $r=0.21$ ;  $N=31,980$  for secondary education;  $r=0.23$ ;  $N=32,887$  for tertiary education) (Poropat, 2009). This potential decline in predictive validity of conscientiousness on academic performance could be attributed to several reasons. First, assessment tools for student evaluation are more standardized and uniform for students in primary education than for students in higher education (Tatar, 1998). The heterogeneity in measures used

with older students may contribute to more variability in findings. Second, traits other than conscientiousness might contribute more to academic performance in upper academic levels than in lower ones (Poropat, 2009). Third, different methods for measuring conscientiousness could influence differential validities across studies. For example, a meta-analysis showed that observer ratings of personality traits predict academic achievement better than self-ratings (Connelly & Ones, 2010; Poropat, 2014). Observer ratings are more commonly used with children (Roberts & DelVecchio, 2000) since their self-reports are less reliable and this may lead to larger effect sizes with young samples. Lastly, students high in conscientiousness may be more likely to advance to higher education, which could contribute to range restrictions in the data. These range restrictions could help explain attenuations in the relationship between conscientiousness and academic performance at later stages of education (Poropat, 2009).

Several mechanisms have been proposed to explain why conscientiousness is linked to academic achievement. For example, students high in conscientiousness are more likely to sustain effort on academic goals and use more effective time management strategies (Caprara et al., 2011; Chamorro-Premuzic & Furnham, 2003; Corker et al., 2012; Furnham et al., 2003; Usher et al., 2019). Furthermore, students high in conscientiousness are more likely to adopt strategies that directly and indirectly relate to academic performance, such as better attendance, asking questions, and completing homework (Caprara et al., 2011; Rijavec & Miljkovic, 2015). Moreover, conscientiousness is positively related to more effective study habits (e.g., frequency of studying sessions) and positive attitudes toward studying (Conrad, 2006; Conrad & Patry, 2012; Credé & Kuncel, 2008; Donche et al., 2013; Trautwein et al., 2006; Trautwein & Luedtke, 2007), which are more direct determinants of academic performance. When it comes to making decisions, high levels of conscientiousness may help individuals choose strategies and behaviors that benefit long-term achievement goals rather than short-term impulsive satisfaction. In other words, conscientiousness is related to one's self-controlled future orientation through such underlying mechanisms.

## Conscientiousness and Attendance

Class attendance is a key predictor of academic success (Aden et al., 2013; Conard, 2006; Credé et al., 2010; Latif & Miles, 2013). For example, attendance predicts college performance over and above other predictors, such as intelligence, high school GPA, SAT scores, and study habits (Conard, 2006; Credé et al., 2010; Farsides & Woodfield, 2003). Not only is attendance associated with academic achievement, but also with conscientiousness. A meta-analytic review suggests a modest relationship between conscientiousness and class attendance ( $r=0.22$ ; Credé et al., 2010). Students high in conscientiousness are more likely to attend class, and this higher attendance rate is related to better academic performance (Conard, 2006; Farsides & Woodfield, 2003). A cross-cultural study across 64 different countries also showed that conscientiousness positively predicts attendance rates across cultures (Zhang et al., 2022).

Students skip classes for a variety of reasons, such as personal issues (e.g., family responsibilities), lack of penalties for absences (e.g., attendance is not checked), health issues (e.g., disease-related absences), lecture issues (e.g., boring lecture), and emotional issues (e.g., sleep; Demir & Karabeyoglu, 2015; Rijavec & Miljkovic, 2015). Conscientiousness is negatively related to these broad reasons for missing class (Credé et al., 2010; Rijavec & Miljkovic, 2015). Furthermore, facet-level analyses provide insight into potential underlying mechanisms for the relationship between conscientiousness and attendance. While all facets of conscientiousness, to varying extent, are negatively related to absence, industriousness predicts absenteeism more strongly than overall conscientiousness (MacCann et al., 2009). As reflected in particular items for industriousness, individuals high in industriousness tend to work harder and make efforts to succeed compared to individuals low in industriousness. In other words, being highly ambitious and hardworking could manifest higher attendance rates among industrious students.

### Conscientiousness and Motivation

The role of motivation in the relation between conscientiousness and academic outcomes is not yet clear. On the one hand, motivation is a presumed mechanism linking conscientiousness to educational outcomes. However, conscientiousness has also been considered a “motivational construct” (Eisenberg et al., 2014a, 2014b). The latter is intuitive, given the association of conscientiousness with both achievement and goal setting (e.g., Barrick et al., 1993; Klein & Lee, 2006; Sorić et al., 2017), which in turn is also associated with achievement (Poropat, 2009). In fact, recent research shows that the goal-setting content of conscientiousness is one of the strongest predictors of goal-directed changes in behavior (Ludwig et al., 2019).

The question of whether motivation is an explanatory mechanism or whether conscientiousness is a motivational construct remains unclear, in large part due to the unsystematic nature of both the definitions of motivation and the operationalization of measures of motivation and traits. In particular, when the content of conscientiousness is closely examined, it is clear that the items that make up the typical conscientiousness scale are not motivational in nature (Roberts et al., 2014), meaning that the questions do not assess one’s values, interests, goals, or desires. Rather, the content that is goal related focuses on the trait-like aspects of goal setting, not the content per se (e.g., I tend to set challenging goals vs I want to get an A in this class). Conversely, many goal setting and motivational questions default to a question structure that also fails to tap into what a person desires and instead gets at trait-like general tendencies. Thus, the conclusion that conscientiousness is a motivational construct because of its content or because of correlational patterns is potentially misleading.

When measures of motivation, which tap into desires and values that people have, are used in conjunction with traditional trait measures of conscientiousness, both contribute to achievement independently (Trautwein et al., 2009). However, when examined more closely, the interplay between motivation, conscientiousness, and school achievement was found to be more complex. In particular,

the Conscientiousness  $\times$  Interest Compensation (CONIC) model accounts for the association between conscientiousness and interest and describes how they work together in predicting academic effort (Trautwein et al., 2019). According to the CONIC model, both conscientiousness and interest uniquely contribute to explaining academic effort when both constructs are simultaneously considered more important; however, the CONIC model also postulates a compensatory mechanism. The compensatory interaction outlines that individual interest can (partly) compensate for low conscientiousness. Thus, individual interest becomes more important for academic effort in students who are low in conscientiousness. Empirical evidence supports the CONIC model in cross-sectional, longitudinal, and experimental designs (Song et al., 2020; Trautwein et al., 2019). For example, the CONIC pattern was found when predicting academic effort in math, German, and English both in cross-sectional and longitudinal designs (Rieger et al., 2022; Trautwein et al., 2019).

### Summary of Conscientiousness and Educational Outcomes

In sum, conscientiousness is a consistent and reliable predictor of academic performance across different levels of education that provides incremental predictive utility above and beyond background factors like family socio-economic status and cognitive ability. Conscientiousness plays a larger role in predicting academic performance for students in primary school, but its predictive validity endures in magnitude across all grade levels. Many facets of conscientiousness, such as industriousness, are associated with higher attendance rates and academic performance. Finally, conscientiousness is clearly linked to motivational concepts, such as goal setting and confidence, but more research is needed in this domain that clearly articulates what is a trait, a motive, and an outcome. Work like that of the CONIC model is exemplary as it keeps distinctions clearer and thus contributing more nuanced insights on the role of conscientiousness in educational settings.

On another note, student progress is influenced by teacher effectiveness (Rivkin et al., 2005; Sanders & Rivers, 1996). Conscientiousness also remains important to the performance of teachers. As key actors in educational systems, effective teachers are often characterized by organization, planning, and being highly responsible (Kim et al., 2019; Klassen et al., 2017). Thus, conscientiousness is related to positive teaching outcomes. For instance, Patrick (2011) found that teacher evaluations (i.e., student-reports of instructor personality) are most strongly predicted by conscientiousness. Similarly, research notes a positive correlation between conscientiousness and teacher effectiveness across various measures (Duckworth et al., 2009; Garcia et al. 2011; Kim et al., 2019; Robertson-Kraft & Duckworth, 2014). A recent meta-analytic review of the literature found that conscientiousness is particular important for teacher effectiveness alongside extraversion ( $r=0.13$  and  $r=0.19$ , respectively; Kim et al., 2019). Highly conscientious instructors are also valued by students (Kim & MacCann, 2016). Interestingly, some research finds that although conscientiousness is related to teacher academic support and student conscientiousness, it does

not seem to be decisive for objective student academic achievement (Cheng & Zamarro, 2016; Kim et al., 2018). Taken together, these findings suggest that conscientiousness not only has a direct link to student academic but may also affect student outcomes indirectly in the form of more conscientious teachers.

## Is Conscientiousness Always a Positive Factor in Education?

Conscientiousness is generally viewed as an adaptive trait linearly predicting positive educational outcomes, such that higher levels of conscientious are related to greater academic achievement. In contrast, some researchers have argued that too much (excessive) conscientiousness could have a negative impact on outcomes such as achievement, goal pursuit, and psychological adjustment (Carter et al., 2018; Pierce & Aguinis, 2013; Shedler & Block, 1990). In other words, those with high levels of conscientiousness may persist too long at tasks and goals, which would then lead to higher levels of distress and failure in achievement settings like school (Khan et al., 2021; Lucas et al., 2015). More often than not, the way of testing whether conscientiousness can be too much of a good thing is to test a quadratic or curvilinear function along with the linear function (e.g., Carter et al., 2014; Swanberg and Martinsen, 2010). This potentially reveals the downturn in the returns on conscientiousness as one gets higher on the scale.

A cursory, examination of prior research reveals some reported support for curvilinear associations between conscientiousness and various outcomes. For instance, statistically significant curvilinear effects have been reported for job performance (Carter et al., 2014), well-being (Carter et al., 2016), and mental health (Shedler & Block, 1990). Furthermore, studies of clinical issues appear to show a link between high levels of conscientiousness and various forms of psychopathology, such as obsessive–compulsive tendencies and perfectionism (Dunkley et al., 2006; Samuel & Widiger, 2011; Widiger et al., 2002a, 2002b).

A closer examination of this literature would caution the conclusion that high levels of conscientiousness might be problematic. First, no prior research demonstrating a curvilinear effect has been directly replicated by the original authors of the research. Second, when attempts have been made to do a direct or close replication by other authors, the curvilinear effects fail to emerge. For example, the original study showing a curvilinear effect of self-control and well-being (Shedler & Block, 1990) failed to replicate in much larger and more thorough examinations of the same effect (Walton & Roberts, 2004). Furthermore, the more current research ostensibly showing a curvilinear relation to measures of well-being (Carter et al., 2014) failed to replicate across 4 separate studies, multiple statistical models, and numerous similar outcomes (Nickel et al., 2019). Finally, in more recent work, we tested the curvilinear relation between a facet of conscientiousness and math achievement in the PISA 2012 data (Zheng et al., n.d). Across 64 different countries, a few statistically significant curvilinear effects were detected, but a close examination of the patterns showed no evidence of a robust negative relation between conscientiousness and math achievement at the high end of conscientiousness.

Second, when looking closer at the clinical research, what becomes clear is that the findings are problematically confounded with the types of measures used in clinical research. For example, an omnibus measure of perfectionism appears to be positively related to conscientiousness (Dunkley et al., 2006; Stoeber et al., 2009). A closer read shows that once the perfectionism measure is differentiated between maladaptive and adaptive components, conscientiousness shows negative associations with the maladaptive and positive associations with the adaptive components.

Of course, with contradictory findings, it is still possible that there could be negative consequences of high conscientiousness. For example, highly conscientious people also are more likely to react with increased tension to negative feedback (Cianci et al., 2010).

Moreover, in a meta-analytic review of the literature, creative scientists scored high on both positive and negative aspects of conscientiousness (Feist, 1998). This could reflect the possibility that creative scientists have to be simultaneously driven and hardworking (e.g., the industriousness facet of conscientiousness) while prone to question norms and be unconventional. We see this pattern in a longitudinal prospective study of creative achievement in women (Helson et al., 1995). Creative achievers were seen by others as persistent and goal oriented and also unconventional. Similarly, research on creative performance in students found an overall null relation to conscientiousness hiding the fact that the achievement component (industriousness) was positively related, while the dependability component was negatively related to creativity (Reiter-Palmon et al., 2009). Finally, creative populations, such as art students and actors, sometimes score lower on measures of conscientiousness (Dumas et al., 2020; Vedel, 2016). Given the role of education in fostering creativity (Cho et al., 2017), the potential negative impact facets of conscientiousness may have on creative achievement should be understood better. If educational systems foster conscientiousness in an unthinking fashion, they may inadvertently undermine their students' creativity in the process.

Taken together, the research on the potential downsides of conscientiousness is mixed. The evidence for a curvilinear effect, especially on educational outcomes, appears to be weak or non-existent. The remaining negative consequences of conscientiousness appear to be the result of either combining conscientiousness with other negative qualities, like neuroticism, or because of distinct patterns at the facet level of the domain. Well-designed research digging deeper into these issues would be profoundly helpful.

## Association of Conscientiousness with Other Socio-emotional Skills

One of the primary reasons for the increasing significance of conscientiousness in educational science is its inclusion in the list of constructs described as socio-emotional skills (SE Skills). Economists, educational scientists, and policy makers began to realize and advocate for a more systematic focus on socio-emotional skills in the last 15 years. Since that time, numerous reports and publications have called

for systematic educational efforts focused on developing students' socio-emotional skills (OECD, 2021). These calls have been motivated, in part, by the realization that socio-emotional skills are “essential” skills, that is, without skills such as being able to work well with supervisors, cooperate on teams, show up to work on time, handle pressure, and learn on the job, workers will find it difficult if not impossible to demonstrate the technical skills that our educational systems so often attempt to impart.

Socio-emotional skills play important roles in education due to their high predictive validity for educational outcomes and malleability (Duckworth & Meindl, 2018; Duckworth & Yeager, 2015; Santos et al., 2021). One of the notable features of the renewed focus on socio-emotional skills has been the inclusive nature of the effort. A wide range of constructs has been listed in initial efforts to identify important SE skills (Soto et al., 2021a, 2021b). Quite possibly, this inclusiveness may be a source of confusion. For example, it is unclear to what extent the overarching description of the domain as “skills” is best reflected in a construct such as conscientiousness, which is a personality trait, not a skill. On one hand, both skills and traits tap into similar qualities, such as having self-control, being responsible, and hardworking. Furthermore, both skills and traits are thought to be independent from cognitive ability (Soto et al., 2021a, 2021b). Yet, skills are conceptually something learned and implemented strategically, whereas traits are thought to be invoked automatically and habitually (Roberts, 2009). This inclusion of conscientiousness in the SE skills domain raises two important questions: (1) whether and to what degree SE skills are separate from conscientiousness, and (2) whether divergent validity can be established between similar sets of SE skills. In the following section, we review theoretical distinctions between conscientiousness and SE skills, and review many common SE skills that show a strong conceptual if not empirical overlap with conscientiousness. We highlight the most commonly used SE skills, but acknowledge that the list of reviewed SE skills is not exhaustive.

Conceptually, the primary distinction between conscientiousness and SE skills resides in the differences between traits and skills. Historically, conscientiousness, a personality trait, has been viewed as a global and stable construct, capturing enduring patterns of thinking, feeling, and behavior across different situations and time (Baumert et al., 2017; McCrae & Costa, 2008; Whitehurst, 2016). Consistent with that definition, measures of conscientiousness tend to emphasize stable, internal, generalizable attributions to the self (Soto, et al., 2021a, 2021b). In contrast, SE skills have often been described as more malleable and responsive to interventions than personality traits (Duckworth & Meindl, 2018; Duckworth & Yeager, 2015; Santos et al., 2021). Despite a shared behavioral referent, a trait like conscientiousness and a skill like self-control differ in how they are typically assessed. In particular, a skill-based conceptualization ideally would focus on a person's ability to be self-controlled when called upon to do so. In contrast, a trait version of self-control measures a person's typical performance in that domain, rather than what a person may be capable of doing when asked. Somewhat problematically, the assessment of SE skills has not always reflected this distinction. In fact, a great number of SE skills measures use the same measurement approach used to assess personality traits, such

as asking people to indicate how internal, stable, and generalizable their skills are rather than asking what they are capable of doing in specific conditions (e.g., Hogan & Lock, 1995; Napolitano et al., 2021; Soto et al., 2021a, 2021b).

The measurement heterogeneity and overlap with personality traits makes for an awkward situation when reviewing the links between conscientiousness and SE skills. In many cases, researchers who are attempting, in good faith, to study what they believe to be SE skills, end up using measures that are indistinguishable from relevant measures of personality traits, such as conscientiousness, whereas, in other situations, SE skills measures are measured in the appropriate and distinct way from personality traits (e.g., Crowder et al., 2019). What emerges is a complex mix of findings. In one line of research, concepts employed as SE skills are barely distinguishable from conscientiousness and its facets. In another line of research, SE skill measures are more appropriately measured. Thus, in the review that follows, one will find both conceptual and empirical relations between SE skills and conscientiousness that at times feel like we are reviewing the facets of conscientiousness.

## Grit

One of the best-known SE skills is grit. Grit is defined as one's persistence of effort combined with the passion for a long-term goal (perseverance of effort and consistency of interests; Allen et al., 2021; Christopoulou et al., 2018; Duckworth et al., 2007). Researchers have argued that grit is distinct from conscientiousness and that perseverance facet in particular predicts educational performance (Credé et al., 2017; Duckworth & Quinn, 2009; Duckworth et al., 2007; Eskreis-Winkler et al., 2014). It has been argued that grit does so (albeit incremental) above and beyond cognitive ability and conscientiousness (Duckworth et al., 2007). Furthermore, a recent meta-analytic review suggests that the positive relation between grit and academic achievement does not differ across cultures (Disabato et al., 2019; Lam & Zhou, 2022; Li et al., 2018).

However, grits' distinctiveness has been called into question (Credé et al., 2017; Ponnock et al., 2020; Rimfeld et al., 2016; Schmidt et al., 2018). A recent meta-analysis suggests that grit and conscientiousness are almost synonymous, as the two constructs are highly correlated ( $r=0.84$ ; Credé et al., 2017). For instance, McCann and Roberts (2010) suggest that a grit could be viewed as a subset of conscientiousness given the high correlation. Relatedly, Ivcevic and Brackett (2014) found that conscientiousness and emotion regulation ability, but not grit, were predictors of academic achievement in high schoolers after controlling for other personality traits. Furthermore, recent research highlights that the correlation of grit and conscientiousness is largely driven by the same genetic factors (Rimfeld et al., 2016; Tucker-Drob et al., 2016). These findings suggest that if grit is an exemplar SE skill, then conscientiousness would be too. As noted above, grit is seldom assessed as a skill, but rather is typically assessed as a trait, which could contribute to the conceptual and empirical overlap. Given the almost one-to-one content and measurement overlap with measures of conscientiousness, it is not surprising that these two constructs correlate highly.

## Self-control

There is great variation in the operational definitions of self-control. Drawing from a non-trait perspective, self-control can be defined as the capacity to voluntarily avoid distractions and override impulses for undesired behaviors (Duckworth et al., 2014; Tangney et al., 2004; White et al., 1994; Whiteside & Lynam, 2001). Self-control has attracted substantial attention both within and outside education, because of the ample evidence of its importance. For example, meta-analytic results indicated that individuals who are high in self-control tend to have positive outcomes including academic achievement, physical health, relationships, and well-being (Blair & Razza, 2007; De Ridder et al., 2012; Duckworth & Kern, 2011; Duckworth et al., 2013, 2014, 2019; Kuhnle et al., 2012). In educational settings, students often experience conflict between long-term academic goals (e.g., getting a better GPA) and short-term gratifying non-academic goals (e.g., making more friends; Duckworth et al., 2019). Self-control plays an important role in helping students control impulses and focus on long-term academic goals (Duckworth et al., 2016, 2019; Eisenberg et al., 2014a, 2014b; Kuhnle et al., 2012).

Self-control is also seen as a facet of conscientiousness (Roberts et al., 2005). Thus, self-control is measured directly across multiple personality inventories, including as discipline in the Big Five Inventory, as self-discipline in the NEO Five Factor Inventory, and as impulse control in the Hogan Personality Inventory. Conceptually, it is considered to lie at the core of conscientiousness (Costantini & Perugini, 2016; Schwaba et al., 2020; Whiteside & Lynam, 2001). Empirical evidence suggests that self-control is highly correlated with conscientiousness ( $r=0.64$ , Roberts et al., 2005; MacCann & Roberts, 2010). Thus, like grit, self-control at least as measured using current approaches appears to be synonymous with conscientiousness, a personality trait.

## Goal Pursuit

Goal pursuit is the capability to set clear and ambitious goals, where a goal can be defined as a cognitive representation of a future object that the subject is approaching or avoiding (Elliot & Fryer, 2008; Wormington & Linnenbrink-Garcia, 2017). Motivational constructs, such as goal pursuit, have been long considered an integral part of educational psychology. Studies of goal pursuit have mainly focused on the function and process of goals (e.g., goal strategies, commitment, and attainment) and less so on how individual differences in goals are structured and organized (McCabe & Fleeson, 2016; Wormington & Linnenbrink-Garcia, 2017). Goal pursuit also involves directing a subject toward reaching their desired goal.

Despite these different conceptualizations, conscientiousness and goal pursuit are intrinsically linked. For example, aspects of conscientiousness related to self-regulation are highly related to pursuing attainable goals and giving up unrealistic goals (Carver & Scheier, 2000). Also, conscientiousness is positively related to prior goal setting ( $r=0.39$ ) and goal commitment ( $r=0.35$ ) among sales representatives

(Barrick et al., 1993) as well as planfulness in undergraduates ( $r=0.49$ ; Ludwig et al., 2019). As for the predictive validity, goal orientation (i.e., mastery, performance-approach goal orientation) measured using trait-specific conceptualization does not add incremental validity over conscientiousness when predicting academic outcomes (Zheng et al., under review). Like many domains, goal pursuit appears to be both skill and trait. Moreover, the magnitude of the association and meaning of the construct depend greatly on how it is operationalized.

## Task Focus

Task focus is the capacity to maintain concentration on a task and to work hard to complete a task or to achieve a goal (Elliot, 1999; Middleton & Midgley, 1997). In an educational setting, students high in task focus are more likely to complete an assignment and achieve a long-term goal of high GPAs because they are more likely to continuously exert efforts on tasks until the completion (Zimmerman, 1990). The feeling of completing tasks would impart positive emotion, and this will positively reinforce continuous effort for long-term goals (Lam & Zhou, 2022). Research showed that task focus is highly related ( $r=0.19$ ) to academic achievement across cultures and grade levels (Hong & Lee, 2019; Lam & Zhou, 2022).

SE skills that tap into these constructs include persistence (e.g., De Fruyt et al., 2000), primary control (Wrosch et al., 2000), and the perseverance facet of grit (Duckworth et al., 2007). Among these constructs, the association between conscientiousness and the perseverance facet of grit is more heavily investigated, and the distinction between the two is blurry. Meta-analytic results show that the perseverance facet of grit is strongly correlated with conscientiousness ( $r=0.83$ ; Credé et al., 2017). A recent study examined the associations between perseverance and conscientiousness at the item level using factor analysis and found substantial overlap between the concepts (Ponnock et al., 2020). Based on this work, and our efforts at developing faceted measures of conscientiousness, it is best to consider task focus as a facet of conscientiousness, at least in the current forms of measurement available to researchers.

## Attention to Detail

Attention to detail is defined as one's capacity to do careful and thorough work. Attention to detail is highly related to conscientiousness, and it is an important skill that contributes to academic performance (Chamorro-Premuzic et al., 2010; Zimmerman, 1990). Attention to detail or detail management is included in the recently introduced BESSI SE skill framework and showed high correlations with conscientiousness ( $r=0.61$ ; Soto et al., 2021a, 2021b). Students who are high in attention to detail are less likely to make mistakes, more likely to do thorough work, and check their work for mistakes. In teams, team members high in attention to detail tend

to have less tolerance towards making mistakes and pay more careful attention to implementing new ideas (Miron-Spektor et al., 2011). These qualities of students high in attention to detail would help them reach their academic goals (Soto et al., 2021a, 2021b). Attention to detail is an interesting case as it clearly can be operationalized as a skill or a trait and may therefore be an ideal construct to investigate the extent to which the distinction matters.

### Self-regulated Learning

Self-regulated learning has been primarily the focus of educational science (Bjork et al., 2013; Broadbent & Poon, 2015; Zimmerman, 1990; Zimmerman & Martinez-Pons, 1988). Self-regulated learning is an umbrella term that encompasses motivational, affective, behavioral, cognitive, and metacognitive components of learning (Pintrich & De Groot, 1990). It is defined as the capacity to understand and control one's learning environment (Pintrich and Groot, 1990, Pintrich 2000; Zimmerman, 1990). Specifically, individual learners have capacity to monitor and self-evaluate their skills and weaknesses and are able to actively regulate their motivation, affect, behavior, and cognition to fit situational demands. Aspects of self-regulated learning influence the effectiveness of learning in short-term and long-term outcomes, such as performance on quizzes and cumulative GPA (Poropat, 2009; Zimmerman & Schunk, 2011).

Bidjerano and Dai (2007) examined the relation between self-regulated learning strategies and the Big Five model of personality. Individuals high in conscientiousness and openness are more likely to be self-regulated learners than those who are low in conscientiousness and openness. Similarly, Eilam et al. (2009) found that conscientiousness is a predictor of self-regulated learning. Moreover, an aspect of self-regulated learning, metacognition, helps learners set realistic and challenging goals and continuously monitor their progress. Conscientiousness and metacognition are significantly correlated ( $r=0.50$ ; Kelly & Donaldson, 2016). Thus, it would appear that self-regulated learning strategies and conscientiousness are associated at magnitudes quite similar to a typical facet of conscientiousness.

### Responsibility

Defined as the capacity to manage personal and social obligations, responsibility has been most often conceptualized as a value to be fostered in children, often with a focus on social responsibility (Carpenter & Pease, 2013; Lauermann & Karabenick, 2011; Mameli et al., 2019; Wentzel, 1991), and has been highlighted as one of the main goals of education (Gordon et al., 2009; Sternberg, 2002). Like prior domains of SE skills, the distinction between skill-based conceptualization and the personality trait operationalization of responsibility fades when measurement details are more closely examined. For example, like many SE skill measures, personal and social responsibilities are often measured using the same items and ratings as those used for measuring personality traits (e.g., Li et al., 2008). Responsibility also has been identified as a facet of conscientiousness (Roberts et al., 2005) and is directly

measured in Temperament and Character Inventory (TCI) and CCS. Although the skill or capacity of fulfilling personal responsibilities align with the traditional definition of conscientiousness, the idea of responsibility becomes a blend of both high conscientiousness ( $r=0.60$ ) and high agreeableness ( $r=0.39$ ) when it touches the realm of fulfilling social obligation (Soto et al., 2021a, 2021b). Specifically, individuals need the willingness to maintain social harmony as well as the ability to collaborate with other people to fulfill their social obligations. In academic settings, responsibility is associated with attendance and academic achievement, where students go out of their way to manage personal and social obligations as students (Fishman, 2014; Zimmerman, 2006).

### Summary of Conscientiousness and SE Skills

By dint of inclusion in the various lists of SE skills, conscientiousness is clearly an exemplar of a socio-emotional skill. Previous studies have found robust conceptual and theoretical overlap between conscientiousness and SE skills. Future research should endeavor to more carefully distinguish these different conceptualizations by better operationalizing skills as capacities in contrast to traits as proclivities.

### Changeability of Conscientiousness

It is clear from our review that conscientiousness predicts many important educational outcomes and that conscientiousness shows strong overlap with SE skills. Nonetheless, for most practitioners, personality traits remain undesirable for educational purposes because they are assumed to be less amenable to change (Baumert et al., 2017; Bleidorn et al., 2019; Whitehurst, 2016). However, empirical evidence shows that conscientiousness, like all psychosocial constructs, is subject to developmental interplay of continuity and change over time (Roberts & Yoon, 2021). Empirical evidence suggests that rank-order stability of personality traits, including conscientiousness, increases with age (Roberts & Mroczek, 2008; Roberts & Yoon, 2021). Specifically, levels of personality traits, including conscientiousness, seem to be most malleable during adolescence. In addition, normative patterns of personality maturation have been documented throughout the lifespan. Specifically, research has shown that conscientiousness and its respective facets increase from young adulthood through midlife (Jackson, et al., 2009; Roberts et al., 2006). Furthermore, the ability to engage in self-control processes tends to increase throughout childhood into adolescence (Eisenberg et al., 2014a, 2014b; Van den Akker et al., 2014).

Do individuals differ in the extent to which their personality traits change? Recent findings illustrate that contextual factors and life experiences are associated with changes in personality traits including conscientiousness (Bleidorn et al., 2018). Specifically, achievement experiences like those found in education and in work have been linked to changes in conscientiousness across the life course. Furthermore, researchers argue that early childhood and adolescence are particularly important for personality development and later academic

achievement (Conti & Heckman, 2012; Shonkoff et al., 2012a, 2012b). In addition, educational environments provide external factors, such as schedules and increased autonomy of students, that lend themselves well to examine, more specifically to intervene, on conscientiousness (Heckman, 2012). Throughout childhood and school attendance, students hone different skills, such as time management, how to create distraction free environments, and gain more independence as well (Berkowitz & Grych, 2000). The malleability of conscientiousness during that time allows for targeted interventions. For instance, Bleidorn (2012) found that the amount of effort students put into studying for an exam was proportionate to increases in conscientiousness. Relatedly, children who increased their effort on homework showed commensurate increases in conscientiousness (Göllner et al., 2017). Prospective longitudinal studies suggest that major life experiences, such as transitions to the first job, are associated with changes in conscientiousness (Bleidorn et al., 2018). Furthermore, increasing one's investment and commitment to one's work is associated with increases in conscientiousness (Hudson & Roberts, 2014). Taken together, these findings suggest that conscientiousness is a malleable construct that is influenced by various life experiences, such as school activities.

In addition to studies on naturalistic development of personality, another important research paradigm would be interventions to change conscientiousness and its effects on changes in desirable academic outcomes. Initial evidence suggests that targeted interventions can be utilized to change personality traits (e.g., Stieger et al., 2021). One of the best-known social experiments, the Perry Preschool Program, offered preschool education to disadvantaged Black children and subsequently followed participants through the age of 40. The Perry School intervention improved externalizing behaviors (i.e., skills), which affected student achievement scores (i.e., GPA; Heckman & Karapakula, 2019). Life skill interventions are also associated with change in personality traits. Specifically, in educational setting, researchers showed that an intervention to change grit was effective in enhancing grit and was related to positive changes in subsequent GPA (Santos et al., 2021).

The few interventions that have been specifically designed to target conscientiousness suggest that changing conscientiousness is possible. Many people desire to change some aspect of their personality (e.g., to become more organized or be on time more often; Hudson et al., 2020). People with a desire to change their levels of conscientiousness can do so through employing self-directed interventions that involve setting specific, concrete, attainable goals for change (Hudson et al., 2020; Webb et al., 2007). Similarly, self-directed smartphone-based interventions are effective in increasing conscientiousness over short time periods (Stieger et al., 2021), and structured face-to-face coaching interventions show evidence for changes in conscientiousness as well (Martin et al., 2014). In a meta-analysis (Roberts et al., 2017), clinical interventions have also shown to be associated with changes in conscientiousness ( $d=0.19$ ). While the initial evidence appears that school-based interventions can work to improve school outcomes, this research idea is at its initial stages and the results are preliminary.

## Summary

Given the benefits of greater conscientiousness in educational settings, relative malleability of personality among school-aged children to young adults, and emerging evidence that self-directed and more structured interventions can affect change in conscientiousness, we argue that structuring interventions for conscientiousness in educational settings have the potential to yield desirable results. Evidence of targeted change through interventions presents a fruitful avenue for future research in educational sciences to examine whether these interventions prompt meaningful change in academic outcomes.

## Assessment of Conscientiousness Within and Across Cultures

The interest in conscientiousness has transcended the typical western, US-focused research and policy world and is quickly becoming a global issue (OECD, 2021). Given the potential benefit that conscientiousness brings, it is understandable that educational scientists and policy makers in other countries may want to incorporate the assessment of conscientiousness into their educational system (Borghans & Schils, 2015). Unfortunately, measuring conscientiousness across countries and distinct cultures poses significant challenges (Church, 2016). Cultural norms shape one's beliefs, attitudes, and behaviors (Oyserman et al., 2002) and influence self-perceptions of abilities and academic achievement (Byun & Park, 2012; Jerrim, 2015; King & McInerney, 2014). The overarching assessment question posed by cross-cultural assessments of conscientiousness is whether measures work the same way in different countries and regions of the globe. From many standpoints, the answer to that question is unequivocally yes. It appears that conscientiousness emerges in natural language across most cultures (Ashton et al., 2004; De Raad & Peabody, 2005; Lam & Zhou, 2022). Moreover, the correlates of conscientiousness within cultures appear relatively robust (Rossier et al., 2016). The inclusion of personality measures in large-scale multinational assessments, such as the *Trends in Mathematics and Science Study* (TIMSS) and the *Programme for International Student Assessment* (PISA), allow for the examination of learning outcome predictors and academic achievement across countries.

Researchers have put forth various explanations for cross-cultural discrepancies in conscientiousness (e.g., teaching methods and curriculum, Leung, 2006; tutoring, Bray & Kwok, 2003; learning strategies). Most relevant for the current review is the argument based on cultural differences in perseverance and effort (Jerrim, 2015). Generally, greater moral value placed on education, learning as duty and obligation, and the importance of perseverance for a students' family and society at large defines collectivist cultures (e.g., East Asian cultures; Francis & Archer, 2005; Li, 2002). These differences in cultural values are reflected in non-cognitive factors, such that students from East Asian (versus North American) cultures are more likely to persist when confronted with failure (Heine et al., 2001; Zhang & Cross, 2011) and are more likely to attribute their success to perseverance on a task (Jerrim, 2015). Furthermore, a measure of perseverance was included in PISA 2012, which

was determined as a good marker of conscientiousness (Zhang et al., 2022). Xu and colleagues (2021) investigated the relation between perseverance and academic achievement in PISA and found that perseverance was more strongly related to achievement in East Asian cultures compared to Western cultures. In a recent study, Zhang et al. (2022) examined how well perseverance predicted math achievement and truancy, two factors linked to educational success, across 64 different countries in the PISA data. Perseverance was positively associated with math achievement in over 60 of the countries. Similar, albeit less strong, relations were found with truancy in the expected direction. Most disconcertingly, when the perseverance scores were averaged in each country, the patterns of associations were reversed—more persevering countries showed lower levels of math achievement and less persevering countries higher levels of math achievement. These discrepant findings across levels of analysis prompt the question of whether and how one should use conscientiousness measures across different cultures?

Where things break down is when country level means of conscientiousness and their correlates are considered. Commonly, self- or other-reports of personality are collected from people within each culture and aggregated, to compare mean-level across cultures (Costello et al., 2018). Overall, findings show small but meaningful country-level mean differences in personality traits and facets (Allik & McCrae, 2004; Allik et al., 2017). Differences in mean-level personality traits are associated with cultural values (Hofstede & McCrae, 2004), as well as geographic proximity (Allik & McCrae, 2004). For instance, personality profiles of European and North American countries are more similar in mean-level personality traits than those of Asian and African countries (Allik & McCrae, 2004). These findings overall highlight consistent associations of personality traits across geographic regions. However, further examination of intercultural comparisons of conscientiousness suggests a more complex picture. Recent work also indicated that cross-cultural differences are relatively small compared to within sample differences (Allik et al., 2017).

Inconsistencies in findings have cast doubt and raised suspicion about the validity of mean-level differences across cultures (Heine et al., 2008; Meisenberg, 2015). Specifically, findings regarding conscientiousness and its facets are at times paradoxical and counter-theoretical across cultures. For example, per capita gross domestic product (GDP) is often used as an outcome to be predicted by country-level estimates of conscientiousness. Interestingly and contrary to intuitive assumptions, GDP is higher for countries with low levels of country-level conscientiousness (Möttus et al., 2012). Another example of counter-theoretical findings concerns east–west differences in conscientiousness. Compared to North American people, East Asian people are perceived and typically described by others as higher in conscientiousness (Terracciano et al., 2005) and show greater motivation and achievement (Stevenson & Lee, 1996). However, East Asian people rate *themselves* as lower on conscientiousness than people from other cultures (Heine et al., 2008; Möttus et al., 2012; Oishi & Roth, 2009). These surprising, counter-intuitive, and paradoxical findings have prompted discussion about the validity of country-level, mean estimates derived from self-report measures of personality in cross-cultural comparisons. Furthermore, inconsistencies in findings of mean-level differences in conscientiousness across cultures suggest that the use of self-reports, in particular,

might be problematic and not indicative of actual cultural differences (Costello et al., 2018). The lack of predictable associations could be due to artifacts, which casts doubt on the validity of personality measures (Meisenberg, 2015).

A common self-reporting bias that distorts and obscures mean-level comparisons across cultures is called the *reference group effect* (RGE, Heine et al., 2002). This effect describes people's tendency to compare themselves or others to norms and standards within their culture when making subjective self-report ratings on Likert scales (Heine et al., 2002). Cultures with similar comparison standards would appear similar in their personality ratings, thus, threatening the validity of cross-cultural comparisons (Heine et al., 2008). Small differences in comparison standards across cultures emerge in self- and other ratings using hypothetical vignettes, but do not shape ratings of conscientiousness when controlled for (Möttus et al., 2012). A recent study was unable to establish equivalence of anchoring vignettes, which suggests that comparisons across cultures using this approach may also be limited (He et al., 2017). Taken together, the evidence to date indicates that the reference group effect has a small effect on personality ratings and does not explain the counterintuitive differences found across cultures (Möttus et al., 2012).

Culture specific differences in *response styles* present another self-reporting bias that challenges the validity of cross-cultural comparisons and potentially mask mean-level differences in ratings (Hamamura et al., 2008; Möttus et al., 2012). Response styles describe people's tendencies to systematically respond to scale items independent of the item's content (Baumgartner & Steenkamp, 2001), which can systematically differ depending on cultural norms and values (Thomas et al., 2014). For instance, people from Europe show more extreme response styles compared to people from East Asia, which could be due to higher cultural values placed on modesty in East Asian countries (Chen et al., 2014). Importantly, accounting for response style can enhance cultural comparisons to some degree (Möttus et al., 2012). Recent research suggests that utilizing two-alternative forced choice format statements (compared to Likert scale single statements), when assessing personality, can aid in reducing culture specific differences in response style (Sun and Drasgow, n.d).

*Cultural mindsets* are another methodological threat resulting from self- and other-reports (Chen et al., 2014). Cultural mindsets describe common knowledge structures or schemas of goals, belief systems, and concepts that are culturally specific (Oyserman & Lee, 2008), which in turn activate personality traits perceived as congruent with the context. Thus, cultural mindsets shift and shape self- and other-ratings depending on which cultural mindset has been activated. Findings suggest that cultural differences in personality traits might, in part, be accounted for by changes in salient points of reference (Chen et al., 2014). Interestingly, perceived stereotypical ratings of groups are only weakly correlated with aggregate ratings of personality traits of a culture (McCrae et al., 2013). However, it remains unclear which specific aspects of cultural mindsets shape people's ratings.

Achieving *measurement invariance* is imperative for cross-cultural comparisons of personality traits (Thomas et al., 2014; Van de Vijver & Leung, 1997). Measurement invariance implies that one position on a construct should translate to the same observed score independent of culture, which demonstrates that the item functions

the same way across cultures (Meredith & Millsap, 1992). Researchers have suggested that mean-level comparisons should only be done if the item intercepts are equal across comparison groups (i.e., scalar invariance; see also Rossier et al., 2005), which has not yet been consistently demonstrated in cross-cultural comparisons (Church, 2016; Dong & Dumas, 2020; Rossier et al., 2005). Importantly, recent research highlights differences in personality nuances (i.e., item-level) might help explain measurement non-invariance found at trait level (Acha-Amankwaa et al., 2020). Findings show that more meaningful differences across cultures are present at factor facet or nuance level of personality compared to personality traits. Thus, establishing accurate comparisons and rankings of countries on conscientiousness is hindered by methodological issues.

In conclusion, while measuring conscientiousness within cultures and countries appears to work like most other constructs in psychology, country-level, mean level comparisons lead to counter-theoretical and paradoxical findings, as well as methodological concerns outlined above. Statistically controlling for methodological issues only has a small impact on the results (Möttus et al., 2012), which further complicates the issue. Research in education faces a similar debate (Stanat & Lüdtke, 2008). For instance, student math self-concept is low in some of the best-performing countries in PISA (Lee, 2009). However, a fairly strong correlation between self-concept and achievement emerged within countries (Stanat & Lüdtke, 2008). Given the increasing global focus on the role of socio-emotional skills in education, the cross-cultural issues facing researchers attempting to measure constructs like conscientiousness are important to consider. It appears that using measures in educational settings to correlate with or predict outcomes is warranted. But, attempts to draw conclusions about countries or educational policies based on aggregate means in different countries should be avoided until something is done to assure that these measures are conceptually equivalent across countries.

## Conclusions and Recommendations

Conscientiousness has emerged in the last few decades as one of the most important individual difference variables in educational settings. Students who are more conscientious tend to do better in school for a variety of reasons. The importance of conscientiousness in educational settings would justify the attempt to understand how it arises and how it might be fostered.

While conscientiousness has been included in the broader family of SE skill dimensions (Soto et al., 2021a, 2021b), its inclusion is controversial because it is typically conceptualized and measured as a trait. In examining the placement and relationship of conscientiousness within SE skills general and education literature, we have identified a number of issues that remain murky and in need of attention. While conscientiousness is typically measured as a trait, ironically, so are many constructs that are measured as skills. We are in need of research that carefully distinguishes and operationalizes trait and skill conceptualizations of conscientiousness to better understand which aspect of the domain is the most important for school outcomes—the habitual patterns of the trait or the capacity to marshal actions in the

skill? To more adequately assess SE skills, recent research has introduced a comprehensive tool to conceptualize and measure SE skills via the Behavioral, Emotional, and Social Skills Inventory (BESSI; Soto et al., 2021a, 2021b). The BESSI provides an opportunity to assess people's capacity to engage in specific behaviors within 32 skill facets. SE skills measured via BESSI provide distinctive information, despite conceptual overlap with personality traits. Thus, we recommend BESSI, when attempting to measure SE skills.

Future research should more closely examine the relations between nuances of conscientiousness and different types of educational outcomes, such as absenteeism and bullying behavior. Understanding relations between different levels of conscientiousness and educational outcomes could help researchers and educational practitioners disentangle which specific feelings, behaviors, and thoughts relate to important scholastic outcomes for students. Furthermore, it is yet unclear exactly whether and how SE skills related to conscientiousness and trait conscientiousness differentially predict educational outcomes. While personality traits are about individuals' tendencies to behave across different situations, SE skills are about individuals' maximal capacity to behave upon specific situations (Soto et al., 2021a, 2021b). These distinctions in definition and measurement should relate to differential educational outcomes. Moreover, incremental validity of conscientiousness related SE skills over and beyond trait conscientiousness in predicting educational outcomes should be examined to fully understand what helps students thrive at school. Lastly, more research is needed to disentangle how conscientiousness of teachers predicts academic outcomes of students, as previous research showed promises in this direction of research program (Duckworth et al., 2009).

As noted above, targeted interventions can bring about change in conscientiousness. Future research could more closely examine whether changes in conscientiousness shape changes in educational outcomes. For instance, a study using an implementation intention intervention found that the effectiveness of the intervention was moderated by conscientiousness. Specifically, the intervention was especially impactful on class attendance for students low on conscientious (Webb et al., 2007). Thus, conscientiousness interventions may be especially useful in improving academic outcomes for specific sub-populations of students. A recent review found that the effectiveness of school-based interventions on non-cognitive outcomes is positive (Siquiqui & Ventista, 2018); however, how long these interventions last is less clear. More work is also needed to better understand the changeability of conscientiousness through interventions. Despite the stereotype of being unchanging, measures of trait conscientiousness not only show robust changes across the life course, but also changeability via intervention. The unanswered question is whether a skill-based approach to conscientiousness will show even more change and whether educators and policy makers should aim to change the skill or change the trait.

Finally, cross-cultural uses of conscientiousness measures need to be handled with care, especially given their use in multinational surveys (e.g., PISA). While covariances within countries appear to be robust, comparing mean levels across countries appears to be highly problematic, even when measurement equivalence is established. This has important implications for cross country interpretations of

conscientiousness and educational policies and approaches. It would be important not to infer, for example, that specific countries would benefit from efforts to bolster conscientiousness based on their relative standing in educational outcomes compared to other countries. Furthermore, more research is needed to investigate cultural nuances in conscientiousness. In particular, future research could more closely examine potential reasons for contradictory findings in cross-cultural research, which may shed light on the implications for educational outcomes across cultures. Different facets of conscientiousness could have different functional utility in educational settings in different countries.

In sum, conscientiousness, in all its forms, plays important roles in optimal functioning in educational settings. Going forward, our aspirations are to better detail why, whether, and to what extent we should try and foster qualities associated with educational success in our students.

## Declarations

**Competing Interests** The authors declare no competing interests.

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