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A synthesis of causal evidence linking non-cognitive skills to later outcomes for children and adolescents

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Author note: This chapter is based on a report (Gutman & Schoon, 2013) jointly funded by the Education Endowment Fund (EEF) and the Cabinet Office.

Abstract

"Non-cognitive skills" is an umbrella term used to refer to a set of attitudes, behaviors and strategies that are thought to underpin success in school and at work, such as motivation, perseverance and self-control. Non-cognitive skills are increasingly considered to be as important, or even more important than, cognitive skills or IQ in explaining academic and employment outcomes. Despite growing interest in this topic, the causal relationship between non-cognitive skills and later outcomes is not well established. This chapter examines the experimental evidence on a diverse set of non-cognitive skills, assessing whether they can be improved and how far they can lead to better longer term outcomes in a variety of domains. We find that there does not seem to be one specific skill that predicts positive outcomes for young people. Rather, many skills are inter-linked and the enhancement of one of these skills without improvement of the others is unlikely to lead to lasting changes.

Keywords: non-cognitive skills, children, adolescents, effect size, experimental studies

A Synthesis of Causal Evidence Linking Non-Cognitive Skills to Later Outcomes for Children and Adolescents

The concept of 'non-cognitive skills' was introduced by sociologists Bowles and Gintis (1976) as a catch-all phrase to distinguish factors other than those measured by cognitive test scores such as literacy and numeracy. The term "non-cognitive", however, creates a "false dichotomy" between cognitive abilities and what are often seen as psychosocial or soft skills (Farrington et al., 2012). While it is tempting to contrast cognitive and non-cognitive factors, it is an erroneous distinction as "few aspects of human behavior are devoid of cognition" (Borghans, Duckworth, Heckman, & ter Weel, 2008, p. 974). Cognitive and non-cognitive skills interact and cross-fertilise each other and human development would not be possible without their continuous interaction. Therefore, it is important to note that there is little agreement even on whether 'non-cognitive skills' is the right way to describe the set of issues under discussion, and terms such as 'character skills', 'competencies', 'personality traits', 'soft skills' and 'life skills' are also widely used.

There is now growing evidence to suggest that a range of non-cognitive skills are potentially as important, or even more important than, cognitive skills or IQ in explaining academic and employment outcomes (Bowles & Gintis, 2002; Farkas, 2003; Heckman, Stixrud, & Urzua, 2006; Jencks, 1979; Lleras, 2008). In a range of studies from a variety of disciplines, researchers have established an association between early indicators of non-cognitive skills and later academic, social, behavioural, and employment outcomes (e.g., Blanden, Gregg, & Macmillian, 2007; Coneus & Laucht, 2011; Heckman & Rubenstein, 2001; Heckman et al., 2006; Jacob, 2002; OECD, 2015). Researchers have further suggested that social investments in the development of these non-cognitive skills not only would generate substantial returns in future outcomes, but also would help to close the attainment gap between advantaged and disadvantaged youth (e.g., Bowles & Gintis, 2002;

Farkas, 2003; Heckman et al., 2006; Jencks, 1979; Lleras, 2008). A better understanding of the specific or set of non-cognitive skills which are most predictive of successful educational outcomes for children and adolescents is therefore highly desirable not only to promote social justice, but also to enhance the educational system and increase productivity in the economy (Heckman et al.).

Despite the increasing number of studies showing that non-cognitive skills are significantly associated with positive outcomes, only a handful of reviews have assessed and integrated the findings (Rosen, Glennie, Dalton, Lennon, & Bozick, 2010; Farrington et al., 2012). While these reviews provide a framework for understanding the importance of non-cognitive skills in the classroom and school settings, there still remain several gaps in the literature/evidence base. One of the most significant concerns the malleability of diverse non-cognitive skills in an experimental context. An investigation of the causal evidence examining the extent to which specific non-cognitive skills can be improved will provide a greater understanding of the particular skills that are 'fixed' and the ones that can be 'taught' or 'learned'. Another issue concerns the nature of the association between non-cognitive skills and later outcomes. Since most studies of non-cognitive skills employ correlational rather than experimental methods, there is little consensus concerning whether the relationship between non-cognitive skills and later outcomes is a causal one. Within the same vein, it is necessary to consider the strength of the causal evidence and whether these effects are shown to sustain in the longer term future.

In consideration of the growing evidence, as well as the ambiguity, of non-cognitive skills, this review aims to shed light on their malleability, causality and sustainability. In order to do this, we examine the causal evidence on a diverse set of non-cognitive skills, assessing whether they can be enhanced and how far they can lead to improved longer term outcomes in a variety of domains. We also considered whether one of these diverse skills

seems to be the most important in predicting future outcomes. Since we aim to identify key competencies that can be modified, we focus on seemingly more flexible, malleable characteristics which have been linked to positive educational outcomes for children and adolescents. Overall, six factors which have been identified as potential key non-cognitive skills of children and young people are examined including: self-perceptions of ability, motivation, perseverance, self-control, metacognitive strategies, and social and emotional skills.

Method

In order to conduct the review, we first searched Science Direct, PsychInfo, Springerlink, ERIC and Google Scholar, from 1990 to 2013 for English-language journal articles. Searches were conducted separately for each non-cognitive skill. Search terms included 'experiment', 'quasi-experimental', 'children', 'adolescents', 'students', 'intervention' and 'non-cognitive'. For self-perceptions, 'self-concept' and 'self-efficacy' are included. For motivation, 'achievement motivation', 'mind-set', 'intrinsic', 'extrinsic' 'expectancy-value', 'value' and 'interest' are included. For perseverance, 'engagement' and 'grit' are included. For metacognitive strategies, 'metacognition', 'metacognitive' and 'strategies' are included. For social and emotional skills, 'social skills', 'personal skills' and 'social emotional skills' are included.

Multiple selection criteria were required for inclusion of an article. First, only quasi-experimental and experimental studies published in peer-reviewed journals are reviewed. The term 'experimental' alludes only to those studies which use random assignment of a control and treatment group. Studies which use control and experimental groups without random assignment are 'quasi-experimental'. Second, the review is limited to school-age children and adolescents, excluding those focused on university-age students and adults. Studies with mentally or physically handicapped subjects or indicated populations (Munoz,

Mrazek, & Haggerty, 1996) were not included. Lastly, the review focuses on meta-analytic studies of experimental research for specific non-cognitive skills. Meta-analysis, which combines and compares estimates from different studies, can yield more reliable and precise estimates of impact than an individual study examined in isolation (Lipsey & Wilson, 2001). In cases where there are no meta-analytic studies examining a particular non-cognitive skill, the published individual experimental studies are examined, providing greater detail on the most exemplary.

The effect size is provided, whenever available. The effect size, Cohen's *d*, is the standardised mean difference between two groups, such as treatment and control groups. For example, an effect size of .25 would represent a difference of one-quarter of a standard deviation on the outcome measure. Guidelines have been suggested for what can be considered a small (.20), medium (.50) or large (.80) effect size (Cohen, 1988). Hattie (2009) uses these effect sizes for educational outcomes: small (.20), medium (.40) or large (.60). In some cases, the average correlation, Pearson's *r*, is reported. Cohen also provides the following guidelines for the Pearson's *r*, where .10 is small, .30 is medium and .50 is large.

For each of these skills in focus, a definition is first provided. Then, causal evidence of malleability is examined, which indicates whether the skill can be taught or improved. Next, causal evidence showing whether the skill leads to better outcomes later is assessed. Lastly, conclusions are offered, discussing the strengths and weaknesses of the specific skill in question as a causal factor.

Self-Perceptions of Ability

Self-perceptions of ability are an individual's own beliefs about whether or not they *can* accomplish a goal or task. Self-perceptions are often seen as precursors to striving for achievement; and therefore, they are used in many of motivational models (Deci & Ryan,

1985; Wigfield & Eccles, 2000). Positive self-perceptions predict greater motivation which, in turn, encourages students to apply greater effort, leading to improved performance. The main theoretical approaches concerning self-perceptions include self-concepts of ability (Harter, 1982; Marsh & Shavelson, 1985; O'Mara et al., 2006; Valentine, DuBois, & Cooper, 2004) and self-efficacy (Bandura, 1977; Bandura, 2001). The two concepts differ both conceptually and psychologically. In principle, self-concept of ability evaluates how an individual has felt about general past performance, while self-efficacy measures expectations about performing specific tasks in the future.

Self-Concept of Ability

Self-concept of ability has been defined an individual's perception of their ability shaped through their experiences and interactions with their environment (O'Mara et al., 2006; Valentine et al., 2004). Several theorists (e.g., Harter, 1982; Marsh & Shavelson) have conceptualized self-concept in a hierarchical manner, with a global self-concept at the apex of the hierarchy, other subcategories in the middle including academic and non-academic self-concepts, and domain-specific self-concepts such as math self-concept at the bottom. For example, academic self-concept is a student's perception of his or her general ability in school, while math self-concept is his or her belief that they can do well in mathematics.

Numerous interventions have demonstrated that children's and adolescent's self-concepts can be improved. These effects have been calculated in two meta-analytic studies (Haney & Durlak, 1998; O'Mara, Marsh, Craven, & Debus, 2006). In the earlier meta-analysis, Haney and Durlak found that programs which specifically focused on self-concept enhancement were effective in improving self-concept of ability. The mean effect size from pre-test to post-test was .57. A more recent meta-analysis of interventions aimed at children up to age 18 found similar results (O'Mara et al.). The mean effect size for intervention studies which focused on enhancing self-concept from pre- to post-intervention was .67.

Together, these studies suggest that self-concept of ability is malleable for school-age populations.

While there is a wealth of correlational research showing that academic self-concept is positively associated with academic achievement (e.g., Denissen, Zarrett, & Eccles, 2007), there is little evidence that this is a causal relationship. This likely reflects the dynamic nature of academic self-concept. Academic self-concept is a reflection of students' experiences and interactions with others (i.e., parents, teachers, or peers), which inevitably changes as they progress through schooling. In a series of studies, Marsh and colleagues (2006) investigated the causal ordering of self-concept and achievement, concluding that the relationship between academic self-concept and achievement is reciprocal. In other words, the causal pathways move from academic self-concept to achievement and vice versa. Consequently, Marsh and colleagues argue that researchers and practitioners should simultaneously aim to improve both academic self-concept and academic skills. According to Marsh and colleagues, interventions which enhance self-concepts without improving performance are likely to show short-lived improvements in self-concept of ability. Conversely, interventions which enhance students' performance without also fostering self-beliefs of their ability will unlikely show long lasting gains.

In conclusion, while there is overwhelming evidence of a positive relationship between academic self-concept and achievement-related outcomes, there is little empirical evidence of a causal one. While intervention studies have shown that self-concept of ability can be improved, there is a dearth of experimental studies which have manipulated self-concept and then measured its subsequent effect on later outcomes including those which extend beyond academic achievement. As Marsh and colleagues argue (2006), while self-concept of ability might be a useful measure to determine how perception of one's own

ability changes in regard to an intervention, it is not likely to be a factor which, without simultaneously raising performance, will predict substantial change in subsequent outcomes.

Self-Efficacy

Self-efficacy is an individual's belief that they have the capability to succeed at a particular task in the future (Bandura, 1977, 2001). Students' beliefs in their own self-efficacy determine their personal goal-setting, their choice of strategies to achieve their goals, their perseverance when faced with setbacks, and their performance under taxing conditions (Bandura, 1997). Efficacious students are more likely to put forth effort and persevere to achieve a goal, even when facing potential setbacks and failures (Pajares, 1996; Pajares, 2003). Student's beliefs that they can succeed at a particular task are a necessary antecedent to putting forth sustained effort towards its accomplishment in the future.

A multitude of experimental studies conducted in the 1980s examine whether self-efficacy can be enhanced using a variety of different methods including goal-setting, learning strategies, classroom models, attributional feedback, and rewards (e.g., Bandura & Schunk, 1981; Schunk, 1981; 1982; 1983; 1984; Schunk & Hanson, 1985; Schunk, Hanson, & Cox, 1987). Together, this constellation of studies by Schunk and his colleagues (e.g., Bandura & Schunk, 1981; Schunk, 1981; 1982; 1983; 1984; Schunk & Hanson, 1985; Schunk, Hanson, & Cox, 1987) show that perceived self-efficacy is malleable over short-term periods.

Most previous studies examining self-efficacy beliefs in children and adolescents are correlational which is likely due to the difficulty involved with manipulating self-efficacy in an experimental setting. As noted, there are several experimental studies from in the 1980s which have manipulated self-efficacy beliefs which, in turn, predicted better academic outcomes including task persistence, interest and/or performance (e.g., Bandura & Schunk, 1981; Schunk, 1981; 1982; 1983; 1984; Schunk & Hanson, 1985; Schunk, Hanson, & Cox, 1987). Multon and colleagues (1991), furthermore, conducted a meta-analysis of

experimental studies examining the relationship between self-efficacy and academic outcomes. There was a large effect size (r = .58) when examining the relationship of self-efficacy to persistence and academic performance. However, there is less evidence that self-efficacy has a causal relationship with outcomes in non-academic domains.

In conclusion, experimental studies suggest that self-efficacy for a particular task is malleable and that improved self-efficacy predicts greater persistence, interest, and performance later. Together, these findings indicate that self-efficacy beliefs are an essential prerequisite to enhancing both cognitive and non-cognitive skills. In other words, young people may more likely to persist at learning new skills when they believe that they are capable of eventually succeeding, which is especially important when faced with challenging tasks (Pajares, 1996; 2003).

A few caveats must be kept in mind, however. First of all, most of these studies are locally-based and conducted by the same group of researchers in the 1980s. A wider evidence base is necessary to indicate with certainty that increases in self-efficacy lead to improvements in the related skill area, especially in non-academic domains. Second, there is little evidence of a lasting impact of manipulations on later outcomes. Most of these experimental studies measured the outcomes at the end of the trial period; therefore, it is difficult to know whether an increase in self-efficacy was sustained and whether there was an impact on longer term outcomes. One issue to keep in mind is that a lasting impact of any intervention may depend on an individual's continued improvement in that skill area. As with self-concept of ability, there is likely to be a reciprocal association between self-efficacy and academic performance. Strong academic performance validates self-efficacy, strengthens motivation, and reinforces effort and persistence toward academic tasks (Farrington et al., 2012). Lastly, the strength of self-efficacy as a predictor of later outcomes is likely to vary according to the generality versus specificity of its measure (Bandura, 2006).

The best predictors of academic performance in a particular domain are self-efficacy beliefs pertaining to the relevant academic subject (Pajares, 1996). Therefore, programs which target self-efficacy beliefs will likely experience greater impact when they focus on a specific area of improvement and seek to improve self-efficacy beliefs regarding that particular domain, e.g., mathematics.

Motivation

Motivation concerns the study of *why* individuals think and behave as they do. A wealth of motivational theories has focused on understanding the relationship between one's motivation and their later achievement. These include the theory of intrinsic/extrinsic motivation (Deci & Ryan, 1985), achievement goal theory (Dweck & Leggett, 1988; Ames, 1992); attribution theory (Weiner, 1979); expectancy-value theory (Eccles et al., 1983; Wigfield & Eccles, 2000) and locus of control (Rotter, 1966). Here we examine achievement goal theory, expectancy-value theory and intrinsic/extrinsic motivation, all of which have shown some degree of malleability in experimental studies.

Achievement Goal Theory

Achievement goal theory proposes that motivation and achievement-related behaviors can be understood by considering the reason or purpose individuals adopt while engaged in academic work (Ames, 1992; Dweck & Legget, 1988). Achievement goal theory distinguishes two types of goal orientations: (a) a learning orientation is focused on gaining competence in a subject area or skill and (b) a performance orientation is focused on demonstrating competence to others, seeking competition, and comparing performance to others. When individuals believe that they can increase their ability through their own efforts, they are more motivated, put forth sustained effort and persistence, and use strategies to accomplish their goals. Conversely, individuals who believe that their ability is fixed and

cannot be changed are more likely to be dependent on others' assessments of their ability and easily give up when they experience a setback or failure.

Recent research has focused on implementing brief treatments or short-term programs designed to promote growth mindsets. According to Dweck (2006), a learning orientation is equivalent to a "growth mindset", in which the fundamental belief is that "your basic qualities are things you can cultivate through your efforts" (p. 7). A performance orientation, on the other hand, is equivalent to a "fixed mindset" in which the fundamental belief is that "your qualities are carved in stone" (p. 6). Current work in this area has concentrated on changing academic mindsets. Most of this research has focused on university-age students, but there are three published experimental studies of school-age children and adolescents examining growth mindset (Blackwell, Trzesniewski, & Dweck, 2007; Donohoe, Topping, & Hannah, 2012; Good, Aronson, & Inzlicht, 2003).

Two of these studies have both before and after measurements assessing whether children can develop a growth mindset as a result of the intervention. In their intervention, for example, Blackwell and colleagues randomly placed 91 seventh-grade students (age 12) in one of two weekly workshops for eight sessions which were led by trained undergraduate mentors. In the treatment group, students were taught that intelligence is malleable (incremental theory) rather than fixed (entity theory) and that learning changes the brain by forming new connections. In the control group, students were taught only study skills. After the eight-week intervention, the researchers tested the understanding of all students regarding the brain, as well as measured whether student's theory of intelligence (incremental versus entity) changed over the intervention. They found that students in the treatment group endorsed the incremental theory of intelligence more strongly after participating in the intervention (4.36 pre-intervention vs. 4.95 post-intervention (d = .66), but participants in the control group did not change their beliefs about the nature of intelligence (4.62 pre-

intervention vs. 4.68 post-intervention (d = .07). In another example, a quasi-experimental study investigated the impact of Brainology (an online interactive program aimed at encouraging a growth mindset) on the mindset, resiliency and sense of mastery of 33 pupils aged 13–14 years (Donohoe et al., 2012). The program led to a significant increase in mindset scores from pre-test to post-test for the intervention group. The mindset scores of the intervention group also differed significantly from the comparison group (d = 1.20). However, there was no significant difference between their pre-test and follow-up scores three months later, suggesting that the initial impact of the intervention was not sustained.

Evidence further indicates that students in an experimental condition which promotes a growth mindset show significant academic gains compared to their peers in a control condition. For example, Good and colleagues (2003) grouped 138 seventh-grade students, who were mostly minority and low-income adolescents, with an undergraduate mentor. There were four randomly assigned groups. In the first group, students had mentors who also discussed the expandable nature of intelligence. In the second group, students had mentors who discussed that most students initially experience difficulty during the seventh grade transition but that this improves with time. In the third group, students had mentors who discussed the first two messages about the expandable nature of intelligence and the seventh grade transition. In the control condition, students had mentors who focused on the dangers of drug use. At the end of the year, students took standardized tests in math and reading. Students in the experimental conditions had significantly higher reading standardized test scores compared to students in the control condition. Furthermore, female students in the experimental conditions had significantly higher math standardized test scores compared to female students in the control condition. In the study described above, Blackwell et al. (2007) also found that their intervention had a significant effect on students' academic outcomes. Prior to the intervention, both the treatment and control groups had declining

maths grades. After the intervention, the grades of students in the control group continued to decline, while this decline was reversed for the experimental group. At the end of the year, there was an overall difference of .30 grade points between the treatment and control groups. In contrast, students who participated in the Brainology evaluation did not report significant changes in their resiliency or sense of mastery following the intervention (Donohoe et al., 2012). Due to the small size of the sample, however, their findings may not be generalizable.

The results of these interventions suggest that it is possible to change students' mindsets and that doing so may result in small to medium-size improvements in later performance. These findings are supportive of programs focused on developing growth mindsets for children and adolescents. However, there are a number of considerations which must be kept in mind. First of all, only a handful of small, school-based interventions have been conducted which focus on school age children, specifically early adolescents. Therefore, it is not known whether the effects are similar for younger children and whether they are generalizable and transferable across different contexts. Second, much of the research has focused on short-term interventions; and therefore, it is not known whether these interventions translate into long-term, lasting effects. As Donohoe et al.'s (2012) investigation of Brainology suggests, promoting a growth mindset may not necessarily lead to sustained improvement. However, their contrasting findings may reflect inherent differences in an intervention led by undergraduate mentors versus one that employs an interactive online program. It may be that adolescents respond more positively to young people whom they have developed a close relationship compared to a computer software program. This highlights the need for future research which considers the essential characteristics of mindset programs to ensure their transferability and sustainability. Despite these concerns, the evidence so far suggests that promoting growth mindsets enhances the academic achievement of adolescents, particularly when taught by a trained mentor.

However, these conclusions must be taken with caution as the findings to date have focused mainly on short-term outcomes in the academic domain; therefore, it is unknown whether these findings translate to other skill-areas and contexts.

Intrinsic/Extrinsic Motivation

Intrinsic and extrinsic motivation distinguishes between different reasons or goals that give rise to an action (see Sansone & Harackiewicz 2000, for a review). Intrinsic motivation refers to doing something because it is inherently interesting or enjoyable. When intrinsically motivated, a person is moved to act for the fun or challenge involved rather than because of external prods, pressures or rewards. Extrinsic motivation, on the other hand, refers to doing something for instrumental or other reasons, such as getting a good grade. Self-determination theory (SDT) elaborates on the intrinsic/extrinsic motivation distinction with the idea of autonomy versus control (Deci & Ryan, 1985). According to Deci and Ryan, intrinsic motivation develops as a result of autonomous, self-determined decisions that give individuals a sense of control and power. In contrast, extrinsic motivation is created when individuals are forced or compelled to act through controlling situations.

Findings of meta-analytic studies suggest that intrinsic motivation can be manipulated in an experimental setting. In a meta-analysis of 128 experimental studies, Deci, Koestner and Ryan (1999) examined the effects of extrinsic rewards on intrinsic motivation. They found that tangible rewards significantly undermined the intrinsic motivation of children (d = -.39). Another meta-analysis of 41 experimental studies found that choice enhanced intrinsic motivation (d = .55) for children (Patall, Cooper, & Robinson, 2008). Together, these studies indicate that intrinsic motivation can be improved under certain circumstances.

Several recent quasi-experimental and experimental studies have also shown that increased intrinsic motivation leads to higher performance. In a series of studies, Guthrie and colleagues examined the role of intrinsic motivation on reading performance (e.g., Guthrie,

Wigfield & Vonsecker, 2000; Guthrie et al., 2006). In one study, for example, Guthrie et al. (2006) investigated how interesting, hands-on tasks in the classroom stimulate intrinsic motivation for reading. Children in grade 3 (aged 8) were in one of four classrooms which varied according to the number of interesting, hands-on activities (e.g., observations and experiments) that were taught. Students with a higher number of hands-on tasks increased their reading comprehension after controlling for initial comprehension more than did students in comparable intervention classrooms with fewer hands-on tasks. Students' intrinsic motivation further predicted their level of reading comprehension after controlling for initial comprehension.

In another set of experimental studies, Vansteenkiste and colleagues examined the role of goal framing on later performance (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005). Students were randomly assigned to an experimental condition. Each experiment framed students' learning in terms of whether it served a long-term intrinsic or extrinsic goal. Results indicated that test performance and subsequent persistence were greater in the intrinsic-goal condition than in the extrinsic-goal condition. The effect sizes for the intrinsic versus extrinsic-goal condition were .59 for motivation, .21 for test performance and .12 for persistence. These results were replicated in a variety of studies using different intrinsic goals (e.g., personal growth and health), extrinsic goals (e.g., physical attractiveness), learning materials (business communications) and age groups (5th- to 6th-graders, 11th- to 12th-graders, university students).

Together, these studies indicate that intrinsic versus extrinsic-related goals encourage greater motivation, more persistence and higher achievement for students of all ages. These studies further highlight the "here and now" nature of intrinsic/extrinsic motivation (Vallerand, 1997) by demonstrating that context plays an important role in one's orientation

toward either intrinsic or extrinsic goals when engaged in a specific activity. This has positive implications for educators, as it indicates that teachers can help shape student's intrinsic motivation for learning through their teaching methods and classroom context. Nevertheless, this further suggests that intrinsic motivation may not necessarily be an expertise that can be gained through participation in an intervention which then is applicable to other situations and environments. While enhancing intrinsic motivation is an important tool in supporting educational contexts, there is little evidence that intrinsic motivation is a skill that can be cultivated in relation to future outcomes.

Expectancy-Value Theory

According to expectancy-value theory, motivation to achieve is best described as consisting of (1) students' expectations of success and (2) their perception of the overall value of the activity or task. Eccles and colleagues (1983) have defined expectancies for success as individuals' beliefs about how well they expect to do on upcoming tasks, either in the immediate or long-term future. Expectancy beliefs are measured in a similar manner as Bandura's (1997) self-efficacy beliefs. However, expectancy beliefs are considered to be effective only when the task is also considered valuable to the individual. The expectancy-value theory thus includes an additional aspect (i.e. task-value) which has to be considered when predicting engagement with a task.

A few recent experimental studies have examined the role of expectancy-value theory in improving students' school-related outcomes (Cohen, Garcia, Apfel, & Master, 2006; Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustoski, 2009; Hulleman & Harackiewicz, 2009; Harackiewicz, Rozek, Hulleman, & Hyde, 2012). Together, these studies show that interventions can increase students' interest in, and value of, academic tasks and course subjects. Hulleman and Harackiewicz, for example, implemented a school-based intervention where ninth-graders (i.e., age 14) wrote essays each month about weekly topics

in science class. Students were randomly assigned to either a treatment or control group. Students in the treatment group were encouraged to write about the connections between their lives and what they were learning in their science course, while students in the control group were told to write summaries of weekly science topics. After the intervention, students in the treatment group reported a greater interest in science and were more likely to plan to take science-related courses in the future compared to students in the control group. In another study, Harackiewicz and colleagues implemented a three-part intervention which consisted of two brochures mailed to parents and a Web site, all highlighting the usefulness of STEM (Science, Technology, Engineering and Mathematics) courses. Participants were randomly assigned to either an experimental or control group. Mothers in the experimental group reported higher perceived utility value of mathematics and science for their child than did mothers in the control group. The intervention also had an indirect effect on student's perceived utility value through both mother's perceived utility value and conversations; in other words, students perceived more STEM utility if their mothers had higher levels of perceived utility and if they had more conversations with their parents about the value of taking STEM courses. According to Harackiewicz and colleagues, these findings demonstrate that a modest intervention focused on parents can produce significant changes in both parents' and student's perceived utility value of participating in STEM courses.

Experimental studies have documented positive findings, indicating that interventions which increase students' expectations for academic success as well as their personal value of schooling can have a significant impact on their academic choices and achievement in the future. In the study described, for example, Harackiewicz and colleagues (2012) found that their intervention led students whose parents were in the experimental group to take, on average, nearly one semester more of science and mathematics in the last two years of high school, compared with the control group. In another study, Cohen and colleagues (2006;

2009) designed an intervention aimed at reducing the racial achievement gap by countering negative stereotypes about academic abilities and achievement. The researchers focused specifically on students' reflections concerning personally important, overarching values as a way to lessen the threat and stress of negative stereotyped ethnic minority students. The researchers asked African American and White seventh-graders to complete brief writing exercises three to five times during the year. The researchers conducted this experiment with three independent cohorts (N = 133, 149 and 134). Students were randomly assigned to either a treatment or control group. In the treatment group, students wrote about values that were important to them. In the control group, students wrote about a neutral topic. Over two years, the grades of African Americans were, on average, raised by .24 grade points. Low-achieving African Americans were particularly benefited. Their GPA improved, on average, .41 points and their rate of remediation or grade repetition was less (5% versus 18%). In their study of high school students, Hulleman and Harackiewicz, (2009) found similar results. Students in the treatment group who started out with low expectations for success had the greatest improvement in their subsequent grades compared to the control group (.80 grade points difference) at the end of the term. However, there was no significant difference in the grades of students in the treatment group who already had high expectations for success. These findings suggest that expectancy-value interventions may be particularly effective in enhancing the academic outcomes of low-achieving, low-expecting students.

In summary, expectancy-value theory provides a possible framework that may be useful in interventions focused on enhancing self-perceptions and subsequent motivation. Experimental studies designed with an expectancy-value framework show that encouraging young people to consider the value and meaning of a task in their own lives is likely to support their interest and engagement in that domain in the future. This was especially relevant for students who had low expectancies for success. Research has also shown that

task values play a crucial role in the employment of learning strategies. It is not enough for students to know about learning strategies, students must also value the work in order to voluntarily utilize those strategies (Pokay & Blumenfeld, 1990). This is further highlighted by causal evidence indicating that the value of learning tasks may be enhanced by highlighting future intrinsic rather than extrinsic goals (Vansteenkiste, Simons, Lens, Soenens, Matos, & Lacante, 2005). Together, these findings highlight the importance of underscoring the value of tasks for children and adolescents in interventions aimed at improving self-perceptions, motivation, and engagement, more generally. This is particularly salient for females and ethnic minority groups who may encounter negative stereotypes in particular domains regarding their social membership. However, there are only a few school-based experimental studies which have focused on expectancy-value theory, so additional evidence would enhance our understanding of how best to implement interventions in the classroom and beyond.

Perseverance

Perseverance is a widely used concept within research which involves steadfastness on mastering a skill or completing a task. In this review, we focus on two manifestations of perseverance: engagement and grit. Both concepts concern an individual's investment in accomplishing a task or goal, yet they are distinguishable both conceptually and psychologically. Engagement involves how students behave, feel and think regarding their commitment to academic tasks, activities or school more generally (Fredricks, Blumenfeld, & Paris, 2004), while grit refers to a trait-level perseverance and passion for long-term goals which is related to the personality trait of Conscientiousness (Duckworth, Peterson, Matthews, & Kelly, 2007).

Engagement

Engagement is a meta-construct which includes behavioral, emotional and cognitive components (Fredricks et al., 2004). 'Behavioral engagement' draws on the idea of participation; it includes involvement in academic, social or extracurricular activities and involves a range of behaviors such as effort, persistence, concentration, attention, asking questions and contributing to class discussion that are considered crucial for achieving positive outcomes. 'Emotional engagement' encompasses affective reactions to teachers, classmates, academics and school. 'Cognitive engagement' incorporates thoughtfulness and willingness to exert the effort necessary to comprehend complex ideas and master difficult skills. Recent evidence suggests that the three dimensions are interlinked (Li & Lerner, 2013; Wang, Willett, & Eccles, 2011), yet can develop differently over time (Wang & Eccles, 2012).

For the most part, the research on engagement has employed correlational methods and most studies have used engagement as an outcome rather than a predictor (Fredricks et al., 2004, Jimerson, Campos, & Greif, 2003). Evidence from intervention studies, however, suggests that students' engagement may be improved (Christenson et al., 2008; Gregory, Allen, Mikami, Hafen, & Pianta, 2014). Using a randomized controlled design, Gregory and colleagues analyzed the efficacy of the My Teaching Partner-Secondary program to increase behavioral engagement. The program provides teachers personalized coaching and systematic feedback on teachers' interactions with students, using systematic observation of video recordings of teacher-student interactions in the classroom. Findings indicated that teachers in the intervention had significantly higher increases, albeit to a modest degree, in observed student behavioral engagement in their classrooms after one year of program involvement compared to the teachers in the control group (explaining 4% of variance). Another intervention program entitled Check and Connect was developed by Christenson and colleagues (Christenson et al., 2008) to promote student engagement (which includes

academic, behavioral, cognitive and affective components), support regular attendance and improve the likelihood of school completion for students at-risk of school drop-out. Students are assigned a mentor to work with them for at least two years to build relationships with the student, their family and the school staff. The mentor routinely monitors their school attendance and checks for warning signs of school disengagement. They also teach the student problem-solving strategies and encourage active participation in school-related activities. A series of studies have been conducted which measure pre- and post-treatment outcomes, without a control group. Findings show that students enrolled in Check and Connect showed increased levels of school engagement. However, evaluations of the Check and Connect program do not explore the impact of the program on students in comparison to a control group who are not enrolled.

There is scant experimental evidence regarding the role of school engagement in improving students' later outcomes. Findings, for example, indicate that students enrolled in Check and Connect show improved school attendance (Lehr, Sinclair, & Christenson, 2004; Sinclair, Christenson, Elevo, & Hurley, 1998). In particular, the quality and closeness of the relationship between students and intervention staff was associated with improved school attendance, highlighting the importance of emotional school engagement for high-risk young people (Anderson, Christenson, Sinclair, & Lehr, 2004).

In conclusion, research shows a significant correlation between school engagement and positive outcomes including achievement, school retention and emotional wellbeing (e.g., Li & Lerner, 2011; Schoon, 2008; Schoon & Duckworth, 2010; Wang & Eccles, 2012). Evidence from intervention programs also indicate that school engagement may be improved which, in turn, may lead to greater school attendance and participation (Anderson, Christenson, Sinclair, & Lehr, 2004). However, there is very little experimental evidence which has demonstrated a causal relationship between engagement and later outcomes. The

difficulty establishing a causal relationship focuses on the nature of engagement, itself. It has been defined more as an outcome of a situational context, rather than a characteristic of the individual. Thus, school-wide interventions are likely to be the most successful avenue for raising engagement in a learning context.

Grit

More recently, the notion of 'grit' has received much attention. Grit is seen as a non-cognitive trait, based on an individual's passion and perseverance for a goal (Duckworth et al., 2007). The factor that distinguishes grit from other aspects of perseverance is its *long-term* quality: those with grit will work persistently on accomplishing a single overarching goal over an enduring period of time despite facing failure, adversity, boredom or lack of progress (Duckworth et al., 2007).

Duckworth and her colleagues have demonstrated that grit is associated with achievement in a number of correlational studies focused on academically talented students (Duckworth et al., 2007; Duckworth, Kirby, Tsukayama, Berstein, & Ericsson, 2011). Further studies have found positive correlations between grit and positive affect, happiness and life satisfaction (Singh & Jha, 2008); the use of learning strategies (Duckworth et al., 2011) and exercise behavior (Reed, Pritschet, & Cutton, 2012). However, there are no experimental studies to date investigating whether it is possible to improve one's grittiness and whether such improvement has an impact on subsequent outcomes.

In conclusion, there is no causal evidence linking grit to positive outcomes. This is likely due to the conception of grit, which is considered to be an inherent personality trait—related to Conscientiousness (Duckworth et al., 2007). On the same note, however, there is little evidence that grit is, in fact, a stable character trait. Grit has yet to be measured at multiple time points to determine whether it changes or remains constant across time. As with other facets of perseverance, grit is likely to be influenced by multiple factors, including

developmental and situational contexts. There is a wealth of research showing that students' persistence at tasks changes over time and in different situations, such as the studies included this review related to self-efficacy and motivation. This further begs the question whether grittiness is adaptive at all times, in all circumstances and for all individuals. In some instances, there may be hidden costs to being gritty. For example, it may be most productive for an individual to cut their losses and re-focus their energies on a different task with a greater likelihood of success rather than stay the course on one doomed to failure. This may be especially salient for those individuals who do not have extraordinary talent in a specific area. However, since the most of the research on grit has focused on understanding what—beyond intelligence and talent—distinguishes exceptional individuals, these studies cannot easily be generalized to broader populations. Given the lack of experimental evidence and the other concerns noted, there seems little evidence that grit is a possible factor to target for interventions at this time. It may be, however, that further research provides greater clarity on this issue.

Self-Control

Most recently, researchers have focused attention on the construct of self-control and its related terms including self-discipline, delay of gratification, self-regulation and impulse control (Duckworth & Kern, 2011). While the operational definitions vary widely, self-control is defined as the ability to resist short-term temptations and impulses in order to accomplish a higher pursuit. According to Baumeister, Vohs and Tice (2007): "self-control is the capacity for altering one's own responses, especially to bring them into line with standards such as ideals, values, morals and social expectations and to support the attainment of long-term goals" (p. 351).

Self-control is considered to have stable individual differences as measured by Conscientiousness as one dimension of the Big Five aspects of personality. According to

Gottfredson and Hirschi (1990), self-control is comprised of six inter-related characteristics including: (1) impulsivity and inability to delay gratification, (2) lack of persistence, tenacity, or diligence, (3) partaking in novelty or risk-seeking activities, (4) little value of intellectual ability, (5) self-centeredness and (6) volatile temper. These characteristics are believed to come together for individuals with low self-control. Furthermore, Gottfredson and Hirschi posit that self-control is malleable during the first 10/12 years of life, but after this point, while self-control tends to improve with age due to socialization, it is largely unresponsive to any external intervention effort. Thus, although absolute levels of self-control may change within persons (increasing rather than decreasing), relative rankings between persons will remain constant over the life course (Gottfredson & Hirschi)

Interventions have focused on improving self-control, most notably to reduce delinquency and problem behaviors in clinical and non-clinical samples. A recent meta-analysis, for example, examined studies that investigated the effect of early self-control improvement programs (up to age 10) on improving self-control and/or reducing delinquency and problem behaviors (Piquero, Jennings, & Farrington, 2010). Studies which had a randomized controlled evaluation design that provided post-test measures of self-control and/or delinquency and problem behaviors among experimental and control subjects were included. The meta-analysis found that self-control improvement programs are an effective intervention for improving self-control and reducing delinquency and problem behaviors. The effect sizes of the programs were positive and significant and ranged from having a small effect (.28) to having a rather substantial moderate effect (.61), suggesting that self-control improvement programs are by and large successful at improving self-control. The mean effect size of self-control improvement programs for reducing delinquency ranged from -.09 to -.30. The authors conclude that self-control improvement programs should continue to be used to improve self-control and reduce delinquency and behavior problems up to age 10.

Considering these results, future efforts should be made to examine the long-term effectiveness and cost-benefit of self-control improvement programs after age 10 (Piquero et al.).

In the most notable research testing the importance of self-control for academic achievement, Mischel (1981) conducted a series of 'marshmallow'experiments from 1968 to 1974. In those studies, a total of 653 children participated in at least one experiment. Four-year-old children at the Stanford University preschool were left alone with one marshmallow after being told they could have two marshmallows if they waited to eat the one marshmallow until the experimenter returned. "Wait time" was the length of time the child could wait before eating the marshmallow. There was a positive relationship between wait time for the second marshmallow and higher academic achievement and social functioning more than one decade later (e.g., Shoda, Mischel, & Peake, 1990). However, wait time was only associated with later achievement when the marshmallow was put in plain sight and when the children were not taught specific distraction strategies to avoid thinking about the marshmallow. Children who could delay gratification longer were able to devise their own distraction strategies while in plain sight of the marshmallow (Mischel & Mischel, 1983). The underlining message from these studies is not necessarily that self-control predicts achievement but that higher intelligence may make it easier to initiate self-control strategies (Farrington et al., 2012).

In conclusion, correlational evidence suggests that childhood self-control predicts achievement and adjustment outcomes, even in adulthood (e.g., Duckworth & Seligman, 2005; Moffitt et al., 2010; Tangney, DuBois, & Cooper; 2004; Wolfe & Johnson, 1995). Furthermore, experimental studies find that self-control can be improved up to age 10 (Piquero et al., 2010). However, there is little or no experimental randomized evidence showing that self-control is malleable after that point, particularly for adolescents and young

adults. This lack of evidence cannot refute Gottfredson and Hirschi's argument (1990) that self-control after age 10 becomes fixed. Nevertheless, researchers suggest that individuals can strengthen their ability to control their feelings, desires and motivations through practice or exercise (Muravan & Baumeister, 2000). Although self-control may be considered a personality trait – the factors that underlie it—may be influenced by the strategies one employs to delay gratification. For example, the situational context undeniably plays a role in the exhibition of self-control. Circumstances may make it easier or more difficult to control one's impulses, as demonstrated by the Mischel's examination of differing conditions (i.e., putting the marshmallow in plain sight and providing strategies for waiting) on children's wait times. In another interesting twist on Mischel's study, for instance, children were tested using the marshmallow task in an environment demonstrated to be either unreliable or reliable (Kidd, Palmeri, & Aslin, 2013). Children in the reliable condition waited significantly longer than those in the unreliable condition, suggesting that wait times reflected rational beliefs about whether waiting would ultimately pay off. Thus, wait times on sustained delay-of-gratification tasks (e.g., the marshmallow task) may not only reflect differences in self-control abilities, but also rational beliefs about the stability of their environment. Therefore, while individuals may have different innate levels of self-control as a personality trait, the degree to which they demonstrate self-controlled behavior may depend on their metacognitive skills as well as their beliefs about the nature of their environment.

Metacognitive Strategies

Metacognitive strategies are goal-oriented efforts to impact one's learning behaviors and processes through focusing awareness on employing strategies which are most conducive to learning (Zimmerman, 2001). Metacognitive strategies, for example, include setting goals, planning and problem-solving, being aware of one's strengths and weakness, monitoring one's progress, and understanding and knowing when and why to use certain strategies

(Pintrich, 2000). The use of different metacognitive strategies also varies according to the developmental stage of the child or young person (Kuhn, 1999; Steinberg, 2005). For instance, younger children are more likely to use overt strategies such as talking aloud during problem-solving (i.e., self-talk), while older children are more likely to use complex strategies such as evaluating their own style of learning and assessing what they know and what they do not know (i.e., self-appraisal).

There is a wealth of experimental studies showing that metacognitive strategies can be learned, particularly within specific academic subjects. A recent meta-analytic study has synthesized these effects. Dignath et al. (2008) examined 48 studies investigating the effect of training in self-regulation on learning and use of strategies among students in first to sixth grades. The overall effect size for all studies examining the effect of any type of self-regulation training on the use of cognitive or metacognitive strategies was .73. Training that specifically emphasized metacognitive strategies had an effect size of .54. Training approaches that combined metacognitive components with other aspects of self-regulation, such as cognitive or motivational strategies, were even more successful, with average effect sizes of .81 and .97, respectively. The most effective metacognitive strategies included the combination of planning and monitoring (mean effect size = 1.50) and the combination of planning and evaluation (mean effect size = 1.46), both of which were more successful than teaching any of the skills in isolation or teaching a combination of all three metacognitive skills (planning, monitoring and evaluation).

Four meta-analytic studies have further demonstrated medium to large effects of teaching metacognitive strategies on later performance. In an earlier meta-analysis of quasi-experimental studies by Haller, Childs and Walberg (1988), for example, the average effect size of metacognitive instruction on reading comprehension across 20 studies contrasting experimental and control groups was .71. They found that children aged 12 to 13 benefitted

most from metacognitive strategy instruction and that reading comprehension was greatest when instruction combined the use of several metacognitive strategies rather than focusing on only one or two (Haller, Childs, & Walberg). Hattie, Biggs and Purdie (1996) meta-analyzed 51 studies in reading and other subject areas, including quasi-experimental, pre- and post-test, and other designs. They found that the average weighted effect sizes due to training in cognitive and metacognitive skills were .57 on performance, .16 on study skills expertise, and .48 on positive affect. Higgins, Hall, Baumfield and Moseley (2005) conducted a meta-analysis of 29 studies that evaluated the impact of thinking skills programs in schools. Quasi-experimental studies were selected for the meta-analysis if they had sufficient quantitative data to calculate an effect size (relative to a control or comparison group of pupils) and if the number of research subjects was greater than .10. They found that thinking skills programs have an above average effect size of .62 on learning outcomes compared to other researched educational interventions. There was relatively greater impact on tests of mathematics (.89) and science (.78), compared with reading (.40). In the meta-analysis already described, Dignath and Buttner (2008) found that training produced an average effect size of .69 across mathematics, reading/writing and other subjects. Effect sizes were higher when the training was conducted by researchers instead of regular teachers. Moreover, interventions attained higher effects when conducted in the scope of mathematics than in reading/writing or other subjects. Together, these studies show that meta-cognitive training has large effects on mathematics and science and medium size effects on reading and positive affect.

In summary, there is clear evidence that metacognitive strategies are malleable and can be taught or otherwise developed in both younger and older students and across a wide range of academic subjects. They have also been shown to have medium to large effects on a number of academic outcomes. However, there a few caveats to keep in mind. First and foremost, it has not been shown whether or not the positive effects of training persist over

longer term and whether students are able to transfer learning strategies from one context to another, particularly non-academic domains. For example, there is evidence suggesting that the benefits of "thinking skills" programs often fade over time and do not generalise to other subjects or situations (Claxton, 2007). Second, these studies often rely on student self-reports of strategy use or teacher reports of observable student behavior. As a result, researchers cannot be certain whether metacognitive strategies have actually been learned and employed or whether students are simply reporting what they think should to the researchers, based on the content of the training (Farrington et al., 2012). Third, as already discussed, students must be motivated to utilize metacognitive strategies in the first place. Schunk and Ertmer (2000) argue that teaching a strategy does not necessarily guarantee that students will continue to use it, especially if they believe that the strategy is not considered as important for their success compared to other factors. Students must believe they have the capacity to learn strategies and be motivated to put forth the additional effort necessary to make use of them. Previous research documents the relationship between academic self-efficacy, motivation and metacognitive strategy use (e.g., Pintrich, 1999; Zimmerman, Bandura, & Martinez-Pons, 1992); thus, underscoring interventions need to consider the interplay among these factors. Providing feedback concerning both the value of the strategy and how well students are applying it, furthermore, increases achievement and the use of self-regulatory strategies more than instruction in strategy use alone (Zimmerman, 2001). In consideration of these concerns, further research is needed to identify the causes which underlie the positive effects of meta-cognitive skills programs, to determine whether their impact is due to specific aspects of the particular program or to broader changes in teaching and learning processes resulting from their implementation (Higgins et al., 2005).

Social and Emotional Skills

Social and emotional skills are defined as "socially acceptable learned behaviors that enable a person to interact effectively with others and to avoid socially unacceptable responses" (Gresham & Elliot, 1990, p. 1). They include a range of pro-social behaviors such as being cooperative, sharing, helping, communicating, expressing empathy, providing verbal support or encouragement, and showing kindness. Most studies tend to examine different types of pro-social behaviors together, as a single construct. As a result, there is less information regarding the predictive nature of individual facets of social skills on other outcomes. For example, there are few studies examining the role of communication skills in predicting later achievement, with the exception of research focused on clinical populations (e.g., autistic children). Furthermore, a wealth of research embeds pro-social behavior in the more expansive concept of social-emotional learning (SEL).

Despite these limitations, there are several meta-analyses of SEL programs showing that, social skills can be fostered (Durlak, Weissberg, & Pacha, 2010; Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Payton et al., 2008). Many of these programs address social and emotional learning (SEL) in school-aged children and most show medium effect sizes for enhancing social skills. In their universal review of 180 studies, for example, Payton et al. found that children participating in SEL universal programs demonstrated improved enhanced social and emotional skills, with an effect size of .60. In another large-scale meta-analysis of SEL programs, Durlak et al. reported that SEL interventions had an average effect size of .57 on improving SEL skills.

Meta-analytic studies further show small to medium effects of SEL interventions on a variety of positive outcomes. In a meta-analysis of After School Programs (ASP) to promote personal and social skills in children, Durlak et al. (2010) found significant mean effects ranging from .12 for school grades, .17 for achievement test scores, .14 for school bonding, .19 for positive social behaviors, .19 for problem behaviors and .34 for child self-perceptions

(i.e., increased self-confidence and self-esteem). In their meta-analysis of school-based universal interventions, Durlak et al. (2011) found that SEL interventions had an average effect size of .23 on attitudes, .24 on positive social behavior, .22 on conduct problems, .24 on emotional distress and .27 on academic achievement. The average follow-up period was 92 weeks (median = 52 weeks). The mean follow-up effect sizes remained significant in spite of reduced numbers of studies assessing each outcome: SEL skills (.26), attitudes (.11), positive social behavior (.17), conduct problems (.14), emotional distress (.15) and academic performance (.32).

In conclusion, there is strong evidence that social skills are malleable and that SEL programs have positive, lasting effects on associated factors. However, there are several limitations of this work. First, most of the research bundles positive social skills together; therefore, it is difficult to isolate changes in specific social skills such as communication or cooperation and their subsequent effects on other outcomes. Second, research tends to focus on social skills in younger children, but it is likely that such skills manifest themselves differently as young people transition into high school and beyond, which often requires more complex social norms and interpersonal interactions. While we understand intuitively that social skills are crucial as young people prepare for their future, there is less understanding of how to cultivate these skills in 'real world' settings. This is particularly salient considering that, as students proceed through schooling, social skills are less utilized as independent tasks and exams often determine their grades rather than group work or projects (Farrington et al., 2012). Lastly, fewer longitudinal studies have assessed the impact of social skills on achievement and adjustment in the longer term and the mechanisms through which they impact future outcomes, such as employment, relationships and parenthood. More longitudinal research is needed on how we can enhance social skills, particularly for

adolescents in settings such as schools, early employment and volunteer experiences, and whether these learned skills then translate to more successful outcomes in adulthood.

Discussion

Current debate on non-cognitive skills sometimes implies that there is one key factor– whether, grit, self-control or resilience–that is the 'key to success' for young people and that it is this one crucial ingredient that enables them to succeed over and above cognitive ability or test scores, to overcome disadvantage and flourish even in the face of serious adversity. Whilst this narrative is right to emphasize the importance of non-cognitive factors in determining outcomes for young people over and above cognitive or academic competences, our review finds that there does not seem to be one non-cognitive skill that predicts positive outcomes for young people. Rather, many skills are inter-linked and the enhancement of one of these skills without improvement of the others is unlikely to lead to lasting changes.

The evidence is compelling that there are strong *associations* between non-cognitive factors and positive outcomes for young people. Measurable factors such as self-control and school engagement are correlated with positive outcomes in the future such as academic attainment, labour market outcomes, and reduced crime (Blanden, Gregg, & Macmillian, 2007; Heckman & Rubenstein, 2001; Heckman et al., 2006; Jacob, 2002). But as our review shows, robust, causal evidence that improvement in non-cognitive skills leads to better longer term outcomes is much more limited. Most experimental studies look at single non-cognitive skills in isolation and over relatively short timeframes. So far, the evidence is relatively weak on whether improvements to non-cognitive skills are transferable across domains and are sustained into the future.

That said, there are significant signs of promise. When developed in combination, skills such as self-efficacy, motivation, and meta-cognitive strategies appear to be influential

in improving academic learning and success in children and young people. Future studies should provide more of an empirical basis of their impact on outcomes other than academic achievement, especially regarding those which are longer term. The enhancement of social and emotional skills, in addition, has been shown to lead to a variety of positive outcomes. Programs that foster social and emotional development have shown to have low to moderate effects on improving associated skills including positive self-perceptions, social and emotional adjustment and academic achievement.

In conclusion, there is no definite estimation regarding whether there is a single characteristic which is the crucial ‘silver bullet’ to improve or facilitate attainment across a wide distribution of outcomes. In fact, many of these factors are interlinked and there is much overlap among them, yet most studies either investigate them in isolation or subsumed under the rubric of non-cognitive skills without parcelling out their unique effects. Furthermore, within any given concept such as ‘motivation’ or ‘self-control’, there is a long history of theory and measurement and competing definitions of what is being discussed and measured. Given this complexity, it is little surprise that debate sometimes becomes focused on a simple, single measure of potential. What this review suggests, ultimately, is that it is essential to keep a broad view and consider a range of skills in combination with each other. When developed in combination, skills such as self-efficacy, motivation and meta-cognitive strategies appear to be influential in improving academic learning and success in children and young people.

Despite significant gaps in the evidence, there are areas of promise and that further, long-term studies will help to build the case for investing in the development of non-cognitive skills and improving outcomes for young people. Priorities for future research should be to understand the extent to which skills can be influenced through intervention, the transferability of skills across domains and how far changes can be sustained into the future.

Future studies should also provide more of an empirical basis of the impact of non-cognitive skills on outcomes other than academic achievement, especially regarding longer-term outcomes such as health, wealth, wellbeing and social integration.

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