Personality Traits, Learning and Academic Achievements

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Abstract

There has been an increased interest in personality traits (especially the five-factor model) in relation to education and learning over the last decade. Previous studies have shown a relation between personality traits and learning, and between personality traits and academic achievement. The latter is typically described in terms of Grade Point Average (GPA). This review paper gives an overview, based on previous research, of highly relevant factors that might explain the relation between personality traits and learning on the one hand and the relation between personality traits and academic achievement on the other hand. Motivation, goals and approaches to learning are important factors that are associated with some personality traits. Two conclusions can be made from this review: (1) intrinsic motivation, a deep approach to learning and learning goals are associated with general knowledge and good test results, all linked together by the openness trait; (2) extrinsic (in combination with intrinsic) motivation, an achieving (in combination with deep) approach to learning and performance goals (in combination with learning goals) are associated with high grades in general linked together by the conscientiousness trait. Openness is associated with learning and general knowledge while conscientiousness is associated with academic achievement.

Keywords: five-factor model, personality traits, learning approaches, academic goals, intelligence, grades

1. Introduction

From behavioristic and sociocultural theoretical perspectives, individual differences are not central to learning and academic achievement. A Piagetian, constructivist perspective considers individual differences but mainly based on developmental and age-related aspects. During the last few decades individual differences have also been of interest to the study of learning and academic achievement from a personality psychology point of view. The most popular and empirically solid model within personality research, the five-factor model, focuses on five categories or dimensions, or so-called personality traits. These traits are easily distinguishable from each other and are stable over long periods of time. The personality traits, often called the Big Five, are named Openness to experience (O), Extraversion (E), Conscientiousness (C), Agreeableness (A), and Neuroticism (N).

Because the five big traits are so stable and easily distinguishable from each other, it has become rather successful to relate/correlate these traits with abilities, behaviors, methods, strategies and achievements. Within the field of *educational research* some researchers have tried to combine personality traits, especially the big five, with some typical academic or school related factors/aspects. Within the field of *personality studies* researchers have become interested in factors and aspects that are relevant to learning and academic achievement. Sometimes independent of each other, results and tendencies have been produced that may be of benefit for educational theory building, education application, improvement of practices and so on. Based on the interest in combining personality traits with learning and academic achievement and the rather large amount of empirical studies, it is time to get an overview of the findings.

Hattie (2009) has concluded that personality traits and learning have a low relation. Only the personality trait conscientiousness has an impact on learning in school. The phenomenon is just briefly discussed. Even if this conclusion is true it is an interesting finding. Why is only one trait related to learning and academic achievement? Is that not a bit suspicious? A deep review of existing studies is needed to find out what is going on underneath the surface.

1.1 The Purpose

The purpose of this review paper is to (1) examine studies on learning in relation to personality traits, (2) examine studies on academic achievement and Grade Point Average (GPA) in relation to personality traits, (3) show the possibility to understand individual differences from a personality perspective, (4) find out how and if important factors like motivation, goals and approaches to learning might affect learning and academic achievement, (5) find out how and if these important factors are related to personality traits as mediators to learning and academic achievement, and (6) discuss possible systematic patterns in relation to the traits. In short the purpose is to find out if personality traits, mediated by factors like motivation, goals and approaches to learning, are related to learning and academic achievement. To do this the paper starts with a section on personality traits, then moves on to sections on different views on learning, motivation, strategies and goals followed by a section on test results and academic achievement (GPA) in different school subjects, and ends with a discussion on the tendencies related to personality traits.

2. Personality Traits—The Big Five

For millennia people have been described in terms of temperaments. We seem to have a tendency to put labels on others and we also seem to have differences that have some kind of regularity or pattern. Personality and personality traits have been studied closely since Freud and Jung. Jung distinguished between introverts and extraverts. Some scholars have carried on in that tradition while others have chosen alternative ways to describe differences in man. There is a large variety in the study of personality (Mischel, 1999) but the tradition that has gained a lot of attention over the last few decades is the one focusing on the five-factor model (Matthews, Deary, & Whiteman, 2013). This model is based on five distinguishable personality traits. The research by Paul Costa and Robert McCrae has paved the way for the five-factor model. They managed to include a lot of previous empirical material as well as theoretical attempts in their new model. A scattered scene of traits became grouped into one model (Costa & McCrae, 1992; cf Hong, Paunonen, & Slade, 2008).

The five traits are shown to be consistent and stable over time (McCrae & Costa, 2006). Traits have to be stable and not change from one day to another or be affected by a temporary mood or external factors. People have been followed for years to see to what degree the traits may change. The stability over time is high (Abe, 2005; McCrae & Costa, 2006; Hampson, Andrews, Barckley, & Peterson, 2007; Edmonds, Goldberg, Hampson, & Barckley, 2013; cf. Neppl et al., 2010). There are also strong correlations between self-report, parent reports, teacher reports and friend reports (McCrae & Costa, 2006; Barbaranelli et al., 2003). The stability between reports is also high. It is safe to say that personality traits, studied with a reliable test, can be useful.

Table 1. Personality traits and facets

Personality traits	Facets
Extraversion (E)	Talkative, a joiner, physically active, affectionate, passionate, fun-loving
Introversion	Reserved, seeking solitude (a loner), physically passive, quiet, sober, unfeeling
Openness / Open to new experiences (O)	Imagination, creativity, originality, prefer variety, curiosity, liberal
Traditionalist	Down to Earth, uncreative, conventional, uncurious, prefer routines, conservative
Conscientiousness(C)	Conscientious, hard-working, ambitious, well organized, persevering, punctual,
Careless	Quitting, negligent, lazy, disorganized, aimless, late
Agreeableness (A)	Softhearted, trusting, generous, acquiescent, lenient, good-natured
Self-centered	Suspicious, ruthless, stingy, antagonistic, critical, irritable
Neuroticism (N)	Worrying, temperamental, self-pitying, self-conscious, emotional, vulnerable
Emotionally stable	Calm, even-tempered, self-satisfied, comfortable, unemotional, hardy

McCrae and Costa (2006; also Costa & McCrae, 1992; Mervielde, Buyst, & De Fruyt, 1995; Di Blas & Carraro, 2011) believe that personality traits are based on a series of related components called facets. Every trait has an opposite and the facets describe that end as well. Table 1 gives an overview of personality traits and the related facets.

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The five-factor model contains five dimension and each dimension can be seen as a continuum from one extreme end to another (e.g., high on extraversion to high on introversion). This means that every individual is placed somewhere on the continuum of each dimension making up a complex set of combinations. Every individual can have a dominant personality trait or several dominant personality traits. If a person does not recognize him- or herself to be close to one of the extreme ends, such as agreeable or self-centered, but rather more in the middle, these traits are less essential for how the person, for example, makes decisions and behaves. Dominant personality traits, on the other hand, have an obvious effect on the individual. It is therefore expected that an individual who has a dominant extraverted trait is talkative and dislikes being alone and consequently makes decisions that go in line with sociability and often hanging out with others. Matthews, Deary and Whiteman (2013) emphasize that strong personality traits make it likely that a person often acts in a particular way but in certain situations it is possible to act in an atypical, more situation dependent way. Even the most orderly can be sloppy at times and the most introverted may like to join their group of friends at some point.

In the following overview the typical case is that where participants in a study have filled in a personality test and have also answered questions about certain aspects, done specific tests or combined the personality test with the latest grade from school. Since there is, for example, variation in grades within a class, this variation may have a systematic tendency to co-vary with one or several personality traits. If this happens to be the case we can start to infer that the trait may have something to do with the measured factor. Since we are born with a set of traits, it is more probable that the traits are affecting our abilities, performances and so on rather than the opposite. Grades do not make us change a personality trait, at least not in short time spans like a year, so it is more probable that it is the other way around. The trait can affect the grade. If two traits are dominant in a person, one of the traits can "take charge" over schoolwork and make the person get the desired grade.

3. Review Results

3.1 Learning, Motivation and Strategies

Motivation has been found to have some impact on successful learning (Hattie, 2009). But, motivation is, at least, two-sided. Bruner (1966) and many others (e.g., Byrnes, 2008; Jordan, Carlile, & Stack, 2008; Martinez, 2010; Gilhooly & Fioratou, 2013) use the distinction between *intrinsic motivation* and *extrinsic motivation*. Intrinsic motivation comes from the learner herself based on the learner's curiosity for a specific topic. Extrinsic motivation comes from an external source like a teacher, a parent, a desire for or a promise to get a good grade, or some benefits that are prior to or related to the learning process. The relationship between motivation and personality traits has been studied by Kamorraju, Karau and Schmeck (2009). They found a rather strong correlation between openness and intrinsic motivation as well as between conscientiousness and intrinsic motivation. These two traits differ somewhat in their relation to intrinsic motivation. Openness is typically correlated to an intrinsic *motivation to know more* as well as an intrinsic *motivation to be stimulated* while conscientiousness is strongly correlated to an intrinsic *motivation to accomplish* (something in particular). The latter is similar to *achievement motivation* which is not purely intrinsic but a combination of intrinsic and extrinsic (Biggs & Telfer, 1987). A significant but weaker correlation between extraversion and intrinsic motivation and between agreeableness and intrinsic motivation were found but no correlation at all was found between neuroticism and intrinsic motivation. In the same study they found a rather strong correlation between conscientiousness and extrinsic motivation and a smaller but significant correlation between extraversion and extrinsic motivation, and between agreeableness and extrinsic motivation. No correlations were found for openness or neuroticism in relation to extrinsic motivation. If motivation is of importance to learning and academic achievement then conscientiousness is the only trait that is strongly associated with both intrinsic and extrinsic motivation. That may be a key factor to success.

Some research groups have looked at three kinds of motivation in relation to personality traits (e.g., Chomorro-Premuzic & Furnham, 2009; von Stumm & Furnham, 2012). They are called surface motivation, deep motivation and achievement motivation (Biggs, 1987) (Note 1). These kinds of motivations strongly correspond to learning approaches: *surface approach to learning*, *deep approach to learning* and *achieving approach to learning* (Biggs, 1987; Biggs & Telfer, 1987). A surface approach to learning means that the pupil/student tries to memorize or otherwise learn what is needed to pass a test/exam. The motivation is extrinsic (or instrumental) and often grounded in a fear of failure, which the student tries to avoid. There is no long term strategy in this approach. A deep approach to learning implies genuine interest in the area of knowledge and an aim to learn as much and for as long as possible, grounded in an intrinsic motivation. The achieving approach to learning is based on the goal of getting the best possible grade, praise or appearing competent, and in doing so trying to find out what means (e.g., extra reading or asking questions of the teacher) may be useful. The motivation is both

intrinsic (to succeed/accomplish and gain advantages in the future) and extrinsic (good grades, praise and acknowledgment from others). Table 2 (and Table 6) is a summary of ten studies relating the three learning strategies with personality traits. Most of the studies use participants at a college/university level. This makes it less reliable to generalize the tendencies to younger pupils.

Table 2. Approaches to learning: surface learning, deep learning and achieving learning

Personality trait	No of studies	Surface learning	Deep learning	Achieving learning
Openness	(10/10/7)	--------------	++++++++++++++	+++
Conscientiousness	(10/10/7)	-------	+++++++++++	++++++++++
Extraversion	(10/10/7)	---/+	+++++	++++
Agreeableness	(10/10/7)	-------- / +	-/ +++	+++
Neuroticism	(10/10/7)	+++++++++	-----	--/+

For the full table with all details from each study see Appendix A. In three of the ten studies achieving learning was not included. If the plus signs or minus signs exceed the number of studies it means that the correlation in some cases was strong and was marked with a double plus or a double minus.

- = negative significant correlation

+ = positive significant correlation

There are two strong tendencies related to Openness. Openness is positively correlated to the deep approach to learning and negatively correlated to the surface approach to learning. Individuals scoring high on openness thus often tend to be motivated to learn as much as possible about an area of knowledge that they find interesting. They also tend to reject the idea of studying for a test/exam for its own sake. Conscientiousness is also strongly related to two approaches to learning. There is an obvious association between conscientiousness and the deep approach to learning even though it is not as strong as the relation between openness and the deep approach. Conscientiousness, instead, sticks out as the trait most strongly correlated with the achieving approach to learning. This suggest that individuals scoring high on conscientiousness both have a tendency to learn as much as possible on a given subject and to strive to get the best possible grade. These tendencies are well in line with the intrinsic and extrinsic motivation associated with conscientiousness and to that trait only.

The correlations between extraversion and the approaches to learning and between agreeableness and the approaches to learning are visible but weak. The tendencies are rather ambiguous and make it hard to associate or predict anything. Neuroticism is the trait most strongly associated with a surface approach to learning. It can therefore be expected that individuals scoring high on neuroticism will mainly be motivated to learn for the test/exam by means of memorization or similar methods.

3.2 Academic Goals

Goals are mental representations of desired end states (Jensen, 2009). If you know what you want you can start striving for it. If you do not know what you want there is no clear path. Goals are strongly associated with both motivation and learning (LeDoux, 2002; Gilhooly & Fioratou, 2013). Clear goals are seen as an important and positive factor of learning (Hattie, 2009). There are a number of different kinds of goals. Two types have been studied in relation to personality traits: learning goals and performance goals. Learning goal means that an individual has a specific goal for learning a specific subject/competence. The learning goal is a primary goal or an intrinsic goal. We learn for its own sake. A performance goal is, in a way, a secondary goal since we learn to be able to perform well in the eyes of others. The learning is just a means for the performance. The performance is the end. Six studies have looked at the relation between personality traits and goals (see Table 3 and Table 7).

Table 3. Academic goals: learning goal and performance goal

Personality trait	No of studies	Learning goal	Performance goal
Openness	(6)	++++++++	-
Conscientiousness	(6)	+++++++	++++
Extraversion	(6)	+++++	+
Agreeableness	(6)	+++++	---
Neuroticism	(6)	--	+++++

For the full table with all details from each study see Appendix B. If the plus signs or minus signs in each cell exceed the number of studies it means that the correlation in some cases was strong and was marked with a double plus or a double minus.

- = negative significant correlation

+ = positive significant correlation

All personality traits but neuroticism are associated with learning goals. This association is strongest for the openness trait closely followed by the conscientiousness trait. The neuroticism and conscientiousness traits are associated with performance goals in a positive way while the agreeableness trait is negatively associated with performance goals. This can be interpreted to mean that trait openness and trait conscientiousness influence us to learn for its own sake to a high degree and extraversion and agreeableness have a similar but weaker effect on learning. Conscientiousness and neuroticism can influence us to learn to perform well in the eyes of others, probably to get praise, while agreeableness as a trait will make us avoid this strategy of learning. It is least likely that individuals scoring high on the agreeableness trait will learn just to perform well in the eyes of others.

3.3 Academic Achievement, Test Results and GPA

There are several means to test academic achievement. Most often it ends up measured, however, in a good grade. Before we look at the relation between personality traits and grades it can be interesting to see how the traits are related to intelligence tests, general knowledge tests, language tests and math/science tests. Intelligence tests can be a measure of general development and abilities. It is extremely difficult to score high on an intelligence test without formal education. The idea that some individuals are intelligent without learning and special training is unsupported. To become better at intelligence tests we have to learn. Prior learning is a prerequisite. This is also true for knowledge tests, language tests and math/science tests. The presented test should be, at least in part, a measure of previous learning and understanding. In 15 studies either intelligence or knowledge was tested and compared to personality traits. Four studies checked for language abilities and two studies checked for math/science abilities. SAT, Raven and IQ tests are examples of tests that were used to measure intelligence.

Table 4. Traits in relation to test results: intelligence test, language test and math/science test

Personality trait	No of studies	Intelligence (IQ)	Language test	Math/science test
Openness	(15/4/2)	+++++++++++++++	++++++	+++
Conscientiousness	(14/4/2)	+++++/--	+/-	-
Extraversion	(15/4/2)	----	+/-	
Agreeableness	(15/4/2)	++	++/-	+/-
Neuroticism	(15/4/2)		--	-

For the full table with all details from each study see Appendix C. In one of the fifteen studies conscientiousness was not included. If the plus signs or minus signs in each cell exceed the number of studies it means that the correlation in some cases was strong and was marked with a double plus or a double minus.

- = negative significant correlation

+ = positive significant correlation

One personality trait is strongly associated with intelligence and that is openness. Openness has no negative correlations to intelligence tests. In some studies there are zero correlations, meaning that participants on the other end of the trait (the traditionalist trait) scored equally well. The Neuroticism trait has only zeros and the most probable reason for that is that the opposite end, emotional stability traits, scores equally well. Conscientiousness has some positive correlations but also some negative correlations. Extraversion has only negative correlations which should mean that participants on the introverted end of the dimension scored higher. Two small positive correlations were found between intelligence and agreeableness.

These results are consistent with previous meta-analyses. Openness has the highest correlation to four types of intelligence (general intelligence, crystallized intelligence, visual perception and fluid intelligence). Conscientiousness has zero correlations to three types of intelligence and negative correlations to two types of intelligence. Agreeableness has consistently zero correlations to intelligence tests (Furnham, 2008; Matthews et al., 2013).

In the four studies that report on language abilities, openness has positive correlations in all studies. The rest of the traits have zero correlations and both positive and negative correlations. Language ability or language intelligence is typically associated with openness. It is also reasonable to argue that extraversion is associated with language, especially vocal verbal communication. Introversion is associated with reading, which is also a kind of language ability. These two abilities may balance each other.

Finally, two studies included math/science tests and only the openness trait has a positive correlation in both studies. The other traits have mixed correlations or negative correlations. From previous studies mathematical intelligence is associated with emotional stability (Furnham, 2008). This is also the case in the Spengler et al. (2013) study.

After looking closer at the relation between personality traits and motivation, approaches to learning, goals and specific abilities it is sound to ask if any of this is reflected in the grades. Is intrinsic motivation the best way to learn (Jordan, Carlile, & Stack, 2008; Martinez, 2010) and get good grades? Is the deep approach to learning the best way to get good grades? Are learning goals the best way to get good grades? Do intelligence and special abilities support students to get good grades? These questions are highly relevant and in 28 studies the relation between personality traits and Grade Point Average (GPA) has been matched. In four of these 28 studies and in an additional two studies the language grades and math/science grades are also especially matched.

Table 5. Grades: Grade Point Average (GPA), language grades and math/science grades

Personality trait	No of studies	GPA	Language grade	Math/science grade
Openness	(26/6/6)	+++++++++++++++++++++	++++++	-
Conscientiousness	(28/6/6)	++	+++++++	+++++++
Extraversion	(26/6/6)	++++/----	+/----	-----
Agreeableness	(26/6/6)	+++++++++++	+++++	++
Neuroticism	(27/6/6)	---------	+/-	----

For the full table with all details from each study see Appendix D. In a few studies some of the personality traits are not included. If the plus signs or minus signs in each cell exceed the number of studies it means that the correlation in some cases was strong and was marked with a double plus or a double minus.

- = negative significant correlation

+ = positive significant correlation

One personality trait stands out. Conscientiousness has positive correlations to GPA in all studies but two (zero correlations). It is safe to predict that a person that scores high on the conscientiousness scale also gets good grades in general. The trait is also positively correlated to both language grades and math/science grades. In these cases there are no zero or negative correlations. The general tendency is therefore also valid in specific fields of knowledge.

Openness is also associated with good general grades based on several positive correlations, no negative correlations and nine zero correlations. As expected, the grades for language are positively correlated while the grades for math/science are unrelated. Agreeableness and the relation to GPA is a combination of zero correlations and positive correlations. This is also the case for language grades and math/science grades.

The result for extroversion/introversion is mixed. Both ends are associated with good grades. Introversion, though, has some correlations to math/science grades (negative correlations for extraversion means positive correlations for introversion). When it comes to neuroticism the correlations all over are negative or zero except for one case that is positive. This means that there actually are a number of positive correlations to emotional stability. Emotionally stability is associated with good grades in general (GPA) and with math/science in particular.

To sum it up there are grade correlations to each trait but one trait has more correlations in all three categories than the other: conscientiousness. Even if the other traits have several positive correlations to grades, conscientiousness has the highest correlation in almost every study.

4. Discussion

Every personality trait has some kind of advantage from an evolutionary perspective. Otherwise it would have vanished (Furnham, 2008). It may be beneficial, both for the individual with a trait, and the group, which can benefit from at least one individual's abilities. When it comes to learning, something that we all do frequently, motivation, goal and strategy is in some way related to each personality trait. We all learn but we may be affected by the context and in motivating why to learn. The interesting question is how our traits may affect learning. Formal education, on the other hand, is a specific learning context. In what way do personality traits match the specific traditions, rules, learning environment, interaction patterns, teacher strategies, external motivations, tests and assessment (grading)?

Even if there are five personality dimensions (neuroticism-emotional stability, extraversion-introversion, openness-traditionalism, agreeableness-self-centered, and conscientiousness-careless), three of them get extra attention: neuroticism, openness and conscientiousness. Neuroticism is associated with surface motivation and surface approach to learning, performance goals and low general grades (GPA). The strategy to learn only for the exam, and not to get more than a pass, does not seem successful. Openness is strongly associated with intrinsic motivation, deep motivation and deep approach to learning (and negatively associated with surface learning), learning goals, high levels on intelligence tests, language tests and math/science tests and getting fairly good grades. It seems to make for good conditions for academic achievement but the grades do not match the potential. Conscientiousness is strongly associated with both intrinsic motivation and extrinsic motivation, both deep approach to learning and an achieving approach to learning, and both learning goals and performance goals, and especially good grades. This seems to make for even better conditions for academic achievement. It might even be possible to say that the conditions are making the outcome exceed the potential or at the least reach the full potential since conscientiousness is not associated with high results on tests.

The interesting question in comparing openness and conscientiousness is: why do individuals that score high on the openness scale get high results on intelligence tests, knowledge tests, language tests and math/science tests that you cannot prepare for but get lower grades than individuals that score high on the conscientiousness scale when the latter get mediocre or even low results on tests that they cannot prepare for? Openness is associated with wide general knowledge, something that they can rely on in a diversity of tests and everyday life situations without preparation. The reasonable explanation as to why they know so much is probably because they take their starting points from learning goals, intrinsic and deep motivation and a deep approach to learning. There might also be other factors that allow individuals that score high on openness to be knowledgeable in a wide sense that will be discussed briefly below. The successful correlation between conscientiousness and GPA can of course be explained by the various goals, kinds of motivation and approaches to learning that they apply but this is only useful if there is a possibility for preparation. Individuals that score high on the conscientiousness scale are masters at preparing for specific tasks within a certain timeframe, which leads to good grades but not necessarily to gaining wider general knowledge and understanding.

It can be interesting to look at the abilities that are associated with openness and the mental tools used for learning. Individuals that score high on the openness scale also:

- Score high on creativity tests (Sawyer, 2012; Matthews et al., 2013; Hirsch & Peterson, 2008; Furnham, 2008).

- Are good at problem-solving, critical thinking, elaborative thinking and have high metacognitive capacity (Komarraju et al., 2011; Bidjerano & Dai, 2007).

- Show high levels of autonomy/independence (Costa & McCrae, 1992; McCrae & Costa, 2006).

None of these abilities are correlated with high grades (Bidjerano & Dai, 2007; Credé & Phillips, 2011; Komarraju et al., 2011; Komarraju & Nadler, 2013; Lubbers et al., 2010; Paunonen & Ashton, 2001). Autonomy and critical thinking might actually be negative abilities in schools. If you are an independent and critical thinker you might question authority, for example the teacher, and that is seldom positive. The question is, then, what abilities are correlated to or associated with high grades? This is a list of good candidates:

- Accuracy (Di Fabio & Busoni, 2007; MacCann, Duckworht, & Roberts, 2009).

- Perseverance (Paunonen & Ashton, 2001; Di Fabio & Busoni, 2007; MacCann, Duckworht, & Roberts, 2009).

- Discipline and self-control (Peterson, Casillas, & Robbins, 2006; Komarraju, Karau, & Schmeck, 2009; MacCann, Duckworht, & Roberts, 2009).

- Diligence and hard work (Nguyen et al., 2006; MacCann, Duckworth, & Roberts, 2009).

- *Openness to the cultural* (Di Fabio & Busoni, 2007).

- *Synthetic-analytical thinking* (Komarraju et al., 2011).

- To be able to dedicate the right amount of time, at the right time (Bidjerano & Dai, 2007; Komarraju & Nadler, 2013).

- To be able to exert oneself as much as required (Bidjerano & Dai, 2007; Credé & Phillips, 2011; Komarraju & Nadler, 2013; CF. Lounsbury et al., 2003).

- *To have learning goals* (Steinmayr, Bipp, & Spinath, 2011).

- Both internal and external motivation (Komarraju, Karau, & Schmeck, 2009), and in particular the *internal motivation* to succeed.

- Self-efficacy (De Feyter et al., 2012; Credé & Phillips, 2011; Komarraju, Karau, & Schmeck, 2009)

- Determination (Peterson, Casillas, & Robbins, 2006).

- *Executive functions* (Neuenschwander et al., 2013), even though they have a more positive effect on test result than on grades.

- Ability to perform (Paunonen & Ashton, 2001).

- *Understanding* (Paunonen & Ashton, 2001).

Fifteen out of these 18 abilities are strongly associated with the conscientiousness trait while only six abilities (in italics) are associated with openness in some way. What we can see is that individuals that score high on conscientiousness can plan, organize time and material, and perform. They know how to study and prepare for exams. Individuals that score high on openness know how to gain knowledge, be independent enough to learn stuff that others have overlooked/missed as relevant, create and organize new knowledge, think about their own learning and understand what they learn.

From this review of studies on personality traits in relation to learning and academic achievement we have to ask what kind of education systems we have. Grades do not really seem to match knowledge and skills. This is not just a disadvantage for openness but also extraversion. Extraverts like to talk a lot and socialize. That is not appreciated in most classrooms (Nguyen et al., 2006). Neurotics are too demanding and may be assessed as weak. Introverts, agreeable and conscientious, fit well in school since they are associated with concentration, quietness and hard work (Bipp, Steinmayr, & Spinath, 2008). Especially conscientious and agreeable persons are generally interested in being at school and interested in school subjects (Spengler et al., 2013; Chamorro-Premuzic & Furnham, 2003) and have high attendance (Conard, 2006). It is as if schools are made for and teachers appreciate these traits (cf. Barbaranelli et al., 2003).

Two conclusions can be made from this review: (1) intrinsic motivation, a deep approach to learning and learning goals are associated with general knowledge and good test results, all linked together by the openness trait; (2) extrinsic (in combination with intrinsic) motivation, an achieving (in combination with deep) approach to learning and performance goals (in combination with learning goals) are associated with high grades in

general linked together by the conscientiousness trait. Openness is associated with learning and general knowledge while conscientiousness is associated with academic achievement.

One additional and modest conclusion is that grades to a high degree are a measure of how well students fit in school, not what and how much they have learned. If this is true we have to find better ways to measure learning and give grades that match the level and quality of knowledge and not how well students are suited for classroom activities and school related assignments. We need more research in this area, taking personality traits into account, and new strategies for teachers to acknowledge more ways of achieving academic success.

References

Abe, J. A. A. (2005). The predictive validity of the Five-Factor Model of personality with preschool age children: A nine year follow-up study. *Journal of Research in Personality*, *39*, 423-442. http://dx.doi.org/10.1016/j.jrp.2004.05.002

Barbaranelli, C., Caprara, G. V., Rabasca, A., & Pastorelli, C. (2003). A questionnaire for measuring the Big Five in late childhood. *Personality and Individual Differences*, *34*, 645-664. http://dx.doi.org/10.1016/S0191-8869(02)00051-X

Barthelemy, J. J., & Lounsbury, J. W. (2009). The relationship between aggression and the Big five personality factors in predicting academic success. *Journal of Human Behavior in the Social Environment*, *19*(2), 159-170. http://dx.doi.org/10.1080/10911350802687125

Bidjerano, T., & Dai, D. Y. (2007). The relationship between the big-five model of personality and self-regulated learning strategies. *Learning and Individual Differences*, *17*, 69-81. http://dx.doi.org/10.1016/j.lindif.2007.02.001

Biggs, J. (1987). *Student approaches to learning and studying*. Melbourne: Australian council to educational research.

Biggs, J., & Telfer, R. (1987). *The process of learning*. Sydney: Prentice-Hall of Australia.

Bipp, T., Steinmayr, R., & Spinath, B. (2008). Personality and achievement motivation: Relationship among Big Five domain and facet scales, achievement goals, and intelligence. *Personality and Individual Differences*, *44*, 1454-1464. http://dx.doi.org/10.1016/j.paid.2008.01.001

Bruner, J. S. (1966). *Toward a theory of instruction*. Cambridge, Mass. : Belknap Press.

Busato, V. V., Prins, F. J., Elshout, J. J., & Hamaker, C. (2000). Intellectual ability, learning style, personality, achievement motivation and academic success of psychology students in higher education. *Personality and Individual Differences*, *29*, 1057-1068. http://dx.doi.org/10.1016/S0191-8869(99)00253-6

Byrnes, J. P. (2008). Cognitive development and learning. In *instructional contexts*. Boston: Pearson.

Chamorro-Premuzic, T., & Furnham, A. (2003). Personality predicts academic performance: Evidence from two longitudinal university samples. *Journal of Research in Personality*, *37*, 319-338. http://dx.doi.org/10.1016/S0092-6566(02)00578-0

Chamorro-Premuzic, T., & Furnham, A. (2008). Personality, intelligence and approaches to learning as predictors of academic performance. *Personality and Individual Differences*, *44*, 1596-1603. http://dx.doi.org/10.1016/j.paid.2008.01.003

Chamorro-Premuzic, T., & Furnham, A. (2009). Mainly Openness: The relationship between the Big Five personality traits and learning approaches. *Learning and Individual Differences*, *19*, 524-529. http://dx.doi.org/10.1016/j.lindif.2009.06.004

Chamorro-Premuzic, T., Furnham, A., & Lewis, M. (2007). Personality and approaches to learning predict preference for different teaching methods. *Learning and Individual Differences*, *17*, 241-250. http://dx.doi.org/10.1016/j.lindif.2006.12.001

Conard, M. A. (2006). Aptitude is not enough: How personality and behavior predict academic performance. *Journal of Research in Personality*, *40*, 339-346. http://dx.doi.org/10.1016/j.jrp.2004.10.003

Costa, P. T., & McCrae, R. R. (1992). Four ways five factors are basic. *Personality and individual differences*, *13*(6), 160-166. http://dx.doi.org/10.1016/0191-8869(92)90236-i

Crede, M., & Phillips, A. L. (2011). A meta-analytic review of the Motivated Strategies for Learning Questionnaire. *Learning and Individual Differences*, *21*, 337-346. http://dx.doi.org/10.1016/j.lindif.2011.03.002

De Feyter, T., Caers, R., Vigna, C., & Berings, D. (2012). Unraveling the impact of the Big Five personality traits on academic performance: The moderating and mediating effects of self-efficacy and academic motivation. *Learning and Individual Differences*, *22*, 439-448. http://dx.doi.org/10.1016/j.lindif.2012.03.013

Di Blas, L., & Carraro, D. (2011). Relations between nonverbal intelligence and personality reports in late childhood. *Journal of Research in Personality*, *45*, 112-116. http://dx.doi.org/10.1016/j.jrp.2010.10.004

Di Fabio, A., & Busoni, L. (2007). Fluid intelligence, personality traits and scholastic success: Empirical evidence in a sample of Italian high school students. *Personality and Individual Differences*, *43*, 2095-2104. http://dx.doi.org/10.1016/j.paid.2007.06.025

Dollinger, S. J., Matyja, A. M., & Huber, J. L. (2008). Which factors best account for academic success: Those which college students can control or those they cannot? *Journal of Research in Personality*, *42*, 872-885. http://dx.doi.org/10.1016/j.jrp.2007.11.007

Duff, A., Boyle, E., Dunleavy, K., & Ferguson, J. (2004). The relationship between personality, approach to learning and academic performance. *Personality and Individual Differences*, *36*, 1907-1920. http://dx.doi.org/10.1016/j.paid.2003.08.020

Edmonds, G. W., Goldberg, L. R., Hampson, S. E., & Barckley, M. (2013). Personality stability from childhood to midlife: Relating teachers' assessments in elementary school to observer- and self-ratings 40 years later. *Journal of Research in Personality*, *47*, 505-513. http://dx.doi.org/10.1016/j.jrp.2013.05.003

Furnham, A. (2008). *Personality and intelligence at work*. London: Routledge. http://dx.doi.org/10.4324/9780203938911

Furnham, A., & Bachtiar, V. (2008). Personality and intelligence as predictors of creativity. *Personality and Individual Differences*, *45*, 613-617. http://dx.doi.org/10.1016/j.paid.2008.06.023

Furnham, A., & Monsen, J. (2009). Personality traits and intelligence predict academic school grades. *Learning and Individual Differences*, *19*, 28-33. http://dx.doi.org/10.1016/j.lindif.2008.02.001

Furnham, A., Swami, V., Arteche, A., & Chamorro-Premuzic, T. (2008). Cognitive ability, learning approaches and personality correlates of general knowledge. *Educational Psychology: An International Journal of Experimental Educational Psychology*, *28*(4), 427-437. http://dx.doi.org/10.1080/01443410701727376

Gilhooly, K., & Fioratou, E. (2013). Motivation, goals, thinking, and problem solving. In S. Kreitler (Ed.), *Cognition & Motivation. Forging an interdisciplinary perspective*. Cambridge: Cambridge University Press.

Hakimi, S., Hejazi, E., & Lavasani, M. G. (2011). The relationships between personality traits and students' academic achievement. *Procedia-Social and Behavioral Sciences*, *29*, 836-845. http://dx.doi.org/10.1016/j.sbspro.2011.11.312

Hampson, S. E., Andrews, J. A., Barckley, M., & Peterson, M. (2007). Trait stability and continuity in childhood: Relating sociability and hostility to the Five-Factor model of personality. *Journal of Research in Personality*, *41*, 507-523. http://dx.doi.org/10.1016/j.jrp.2006.06.003

Hattie, J. (2009). *Visible learning. A synthesis of over 800 meta-analyses relating to achievement*. London: Routledge.

Hirsh, J. B., & Peterson, J. B. (2008). Predicting creativity and academic success with a ''Fake-Proof'' measure of the Big Five. *Journal of Research in Personality*, *42*, 1323-1333. http://dx.doi.org/10.1016/j.jrp.2008.04.006

Hong, R. Y., Paunonen, S. V., & Slade, H. P. (2008). Big Five personality factors and the prediction of behavior: A multitrait-multimethod approach. *Personality and individual differences*, *45*, 653-665. http://dx.doi.org/10.1016/j.paid.2008.03.015

Jensen, M. (2009). Lifestyle: Suggesting mechanisms and a definition from a cognitive science perspective. *Environment, Development and Sustainability*, *11*(1), 215-228. http://dx.doi.org/10.1007/s10668-007-9105-4

Jordan, A., Carlile, O., & Stack, A. (2008). *Approaches to learning. A guide for teachers*. Beckshire, England: Open University Press.

Kappe, R., & van der Flier, H. (2010). Using multiple and specific criteria to assess the predictive validity of the Big Five personality factors on academic performance. *Journal of Research in Personality*, *44*, 142-145. http://dx.doi.org/10.1016/j.jrp.2009.11.002

Komarraju, M., & Nadler, D. (2013). Self-efficacy and academic achievement: Why do implicit beliefs, goals, and effort regulation matter? *Learning and Individual Differences*, *25*, 67-72. http://dx.doi.org/10.1016/j.lindif.2013.01.005

Komarraju, M., Karau, S. J., & Schmeck, R. R. (2009). Role of the Big Five personality traits in predicting college students' academic motivation and achievement. *Learning and Individual Differences*, *19*, 47-52. http://dx.doi.org/10.1016/j.lindif.2008.07.001

Komarraju, M., Karau, S. J., Schmeck, R. R., & Avdic, A. (2011). The Big Five personality traits, learning styles, and academic achievement. *Personality and individual differences*, *51*, 472-477. http://dx.doi.org/10.1016/j.paid.2011.04.019

Laidra, K., Pullmann, H., & Allik, J. (2007). Personality and intelligence as predictors of academic achievement: A cross-sectional study from elementary to secondary school. *Personality and Individual Differences*, *42*, 441-451. http://dx.doi.org/10.1016/j.paid.2006.08.001

LeDoux, J. (2002). *Synaptic self. How our brains become who we are*. New York: Penguine Books.

Lounsbury, J. W., Sundstrom, E., Loveland, J. L., & Gibson, L. W. (2003). Broad versus narrow personality traits in predicting academic performance of adolescents. *Learning and Individual Differences*, *14*, 67-77.

Lubbers, M. J., Van Der Werf, M. P. C., Kuyper, H., & Hendriks, A. A. J. (2010). Does homework behavior mediate the relation between personality and academic performance? *Learning and Individual Differences*, *20*, 203-208. http://dx.doi.org/10.1016/j.lindif.2010.01.005

MacCann, C., Duckworth, A. L., & Roberts, R. D. (2009). Empirical identification of the major facets of Conscientiousness. *Learning and individual differences*, *19*, 451-458. http://dx.doi.org/10.1016/j.lindif.2009.03.007

Martinez, M. E. (2010). *Learning and cognition. The design of the mind*. Upper Saddle River, NJ: Merrill.

Matthews, G., Deary, I. J., & Whiteman, M. C. (2013). *Personality traits*. Cambridge: Cambridge University Press.

McCabe, K. O., Van Yperen, N. W., Elliot, A. J., & Verbraak, M. (2013). Big Five personality profiles of context-specific achievement goals. *Journal of Research in Personality*, *47*, 698-707. http://dx.doi.org/10.1016/j.jrp.2013.06.003

McCrae, R. R., & Costa, P. T. (2006). *Personality in adulthood. A five-factor theory perspective*. London: The Guilford Press.

Mervielde, I., Buyst, V., & De Fruyt, F. (1995). THE VALIDITY OF THE BIG-FIVE AS A MODEL FOR TEACHERS' RATINGS OF INDIVIDUAL DIFFERENCES AMONG CHILDREN AGED 4 -12 YEARS. *Personality and Individual Differences*, *18*(4), 1325-1534. http://dx.doi.org/10.1016/0191-8869(94)00175-r

Mischel, W. (1999). *Introduction to personality*. London: Harcourt Brace College Publisher.

Neppl, T. K. et al. (2010). Differential stability of temperament and personality from toddlerhood to middle childhood. *Journal of Research in Personality*, *44*, 386-396. http://dx.doi.org/10.1016/j.jrp.2010.04.004

Neuenschwander, R., Cimeli, P., Röthlisberger, M., & Roebers, C. M. (2013). Personality factors in elementary school children: Contributions to academic performance over and above executive functions? *Learning and individual differences*, *25*, 118-125. http://dx.doi.org/10.1016/j.lindif.2012.12.006

Nguyen, N. T., Allen, L. C., & Fraccastoro, K. (2006). Personality Predicts Academic Performance: Exploring the moderating role of gender. *Journal of Higher Education Policy and Management*, *27*(1), 105-117. http://dx.doi.org/10.1080/13600800500046313

Paunonen, S. V., & Ashton, M. C. (2001). Big Five Predictors of Academic Achievement. *Journal of Research in Personality*, *35*, 78-90. http://dx.doi.org/10.1006/jrpe.2000.2309

Rosander, P., & Bäckström, M. (2012). The unique contribution of learning approaches to academic performance, after controlling for IQ and personality: Are there gender differences? *Learning and individual differences*, *22*, 820-826. http://dx.doi.org/10.1016/j.lindif.2012.05.011

Rosander, P., Bäckström, M., & Stenberg, G. (2011). Personality traits and general intelligence as predictors of academic performance: A structural equation modelling approach. *Learning and individual differences*, *21*, 590-596. http://dx.doi.org/10.1016/j.lindif.2011.04.004

Sawyer, R. K. (2012). *Explaining creativity*. Oxford: Oxford University Press.

Smrtnik-Vitulić, H., & Zupančič, M. (2011). Personality traits as a predictor of academic achievement in adolescents. *Educational Studies*, *37*(2), 127-140. http://dx.doi.org/10.1080/03055691003729062

Spengler, M., Lüdtke, O., Martin, R., & Brunner, M. (2013). Personality is related to educational outcomes in late adolescence: Evidence from two large-scale achievement studies. *Journal of Research in Personality*, *47*, 613-625. http://dx.doi.org/10.1016/j.jrp.2013.05.008

Steinmayr, R., Bipp, T., & Spinath, B. (2011). Goal orientations predict academic performance beyond intelligence and personality. *Learning and individual differences*, *21*, 196-200. http://dx.doi.org/10.1016/j.lindif.2010.11.026

Swanberg, A. B., & Martinsen, Ø. L. (2010). Personality, approaches to learning and achievement. *Educational Psychology: An International Journal of Experimental Educational Psychology*, *30*(1), 75-88. http://dx.doi.org/10.1080/01443410903410474

von Stumm, S., & Furnham, A. (2012). Learning approaches: Associations with Typical Intellectual Engagement, intelligence and the Big Five. *Personality and Individual Differences*, *53*, 720-723. http://dx.doi.org/10.1016/j.paid.2012.05.014

Wang, M., & Erdheim, J. (2007). Does the five-factor model of personality relate to goal orientation? *Personality and Individual Differences*, *43*(6), 1493-1505. http://dx.doi.org/10.1016/j.paid.2007.04.024

Zhang, L. (2003). Does the big five predict learning approaches? *Personality and Individual Differences*, *34*, 1431-1446. http://dx.doi.org/10.1016/S0191-8869(02)00125-3

Zsolnai, A. (2002). Relationship between children's social competence, learning motivation and school achievement. *Educational Psychology: An International Journal of Experimental Educational Psychology*, *22*(3), 317-329. http://dx.doi.org/10.1080/01443410220138548

Zuffianò, A. et al. (2013). Academic achievement: The unique contribution of self-efficacy beliefs in self-regulated learning beyond intelligence, personality traits, and self-esteem. *Learning and individual differences*, *23*, 158-162. http://dx.doi.org/10.1016/j.lindif.2012.07.010

Zweig, D., & Webster, J. (2004). What are we measuring? An examination of the relationships between the big-five personality traits, goal orientation, and performance intentions. *Personality and Individual Differences*, *36*, 1693-1708. http://dx.doi.org/10.1016/j.paid.2003.07.010

Note

Note 1. Biggs and Telfer (1987) suggest four kinds of motivation: Instrumental motivation, achievement motivation, social motivation and intrinsic motivation. The first three can be seen as kinds of extrinsic motivation. Intrinsic motivation is similar to deep motivation. Instrumental motivation is similar to surface motivation. Social motivation (motivated by e.g. belonging) and achievement motivation are different kinds than or combinations of deep and surface motivation. Thus far no one has studied the relation between social motivation and personality traits.

Appendix A

Table 6 (full version of Table 2). Approaches to learning: surface learning, deep learning and achieving learning

Personality trait	No of studies	Surface learning	Deep learning	Achieving learning	Academic level	Comments
Openness	(10/10/7)	---------------	+++++++ +++++++	+++		In total
	Duff et al. (2004)	0	+	+	College	
	Chomorro-Premuzic & Furnham (2008)	0	+	0	University	
	Chomorro-Premuzic et al. (2007)	--	+	0	University	
	Rosander & Bäckström (2012)	--	++		Secondary school	Only girls
	Rosander & Bäckström (2012)	-	++		Secondary school	Only boys
	Furnham et al. (2008)	--	++	0	University	
	Swanberg & Martinsen (2010)	--	++	+	University	
	Chomorro-Premuzic & Furnham (2009)	--	++		University	
	Zhang (2003)	--	++	+	University	
	Von Stumm & Furnham (2012)	-	0	0	University	
Conscientiousness	(10/10/7)	-------	+++++++ ++++	+++++++++ ++		In total
	Duff et al. (2004)	0	++	++	College	
	Chomorro-Premuzic & Furnham (2008)	0	0	0	University	
	Chomorro-Premuzic et al. (2007)	0	+	++	University	
	Rosander & Bäckström (2012)	--	++		Secondary school	Only girls
	Rosander & Bäckström (2012)	--	+		Secondary school	Only boys
	Furnham et al. (2008)	0	+	++	University	
	Swanberg & Martinsen (2010)	--	++	++	University	
	Chomorro-Premuzic & Furnham (2009)	0	0		University	
	Zhang (2003)	-	++	++	University	
	Von Stumm & Furnham (2012)	0	+	+	University	
Extraversion	(10/10/7)	---/+	+++++	++++		In total
	Duff et al. (2004)	0	+	+	College	
	Chomorro-Premuzic	0	+	0	University	

	& Furnham (2008)					
	Chomorro-Premuzic et al. (2007)	0	+	0	University	
	Rosander & Bäckström (2012)	0	0		Secondary school	Only girls
	Rosander & Bäckström (2012)	+	0		Secondary school	Only boys
	Furnham et al. (2008)	0	0	0	University	
	Swanberg & Martinsen (2010)	--	+	++	University	
	Chomorro-Premuzic & Furnham (2009)	0	0		University	
	Zhang (2003)	-	+	+	University	
	Von Stumm & Furnham (2012)	0	0	0	University	
Agreeableness	(10/10/7)	-------- / +	-/ +++	+++		In total
	Duff et al. (2004)	+	-	0	College	
	Chomorro-Premuzic & Furnham (2008)	0	0	0	University	
	Chomorro-Premuzic et al. (2007)	-	+	+	University	
	Rosander & Bäckström (2012)	--	+		Secondary school	Only girls
	Rosander & Bäckström (2012)	--	+		Secondary school	Only boys
	Furnham et al. (2008)	0	0	0	University	
	Swanberg & Martinsen (2010)	--	0	++	University	
	Chomorro-Premuzic & Furnham (2009)	0	0		University	
	Zhang (2003)	-	0	0	University	
	Von Stumm & Furnham (2012)	0	0	0	University	
Neuroticism	(10/10/7)	+++++++ ++	-----	--/+		In total
	Duff et al. (2004)	+	0	-	College	
	Chomorro-Premuzic & Furnham (2008)	0	0	0	University	
	Chomorro-Premuzic et al. (2007)	++	--	0	University	
	Rosander & Bäckström (2012)	+	-		Secondary school	Only girls
	Rosander & Bäckström (2012)	0	0		Secondary school	Only boys
	Furnham et al.	+	0	0	University	

	(2008)				
	Swanberg & Martinsen (2010)	++	-	+	University
	Chomorro-Premuzic & Furnham (2009)	0	0		University
	Zhang (2003)	++	-	-	University
	Von Stumm & Furnham (2012)	0	0	0	University

- = small negative significant correlation

-- = large negative significant correlation

+ = small positive significant correlation

++ = large positive significant correlation

0 = no correlation or small non-significant correlation

Appendix B

Table 7 (full version of Table 3). Academic goals: learning goal and performance goal

Personality trait	Studies	Learning goal	Performance goal	Academic level	Comments
Openness	(6)	+++++++	-		In total
	McCabe et al. (2013)	0	-	College	
	Zweig & Webster (2004)	++	0	College	
	Bipp et al. (2008)	++	0	University	
	Steinmayr et al. (2011)	++	0	High school / gymnasium	
	Chen & Zhang (2011)	++	0	High school	
	Wang & Erdheim (2007)	0	0	Adults	
Conscientiousness	(6)	+++++++	++++		In total
	McCabe et al. (2013)	+	0	College	
	Zweig & Webster (2004)	++	+	College	
	Bipp et al. (2008)	0	0	University	
	Steinmayr et al. (2011)	++	++	High school / gymnasium	
	Chen & Zhang (2011)	++	+	High school	
	Wang & Erdheim (2007)	0	0	Adults	
Extraversion	(6)	++++	+		In total
	McCabe et al. (2013)	+	0	College	
	Zweig & Webster	+	0	College	

	(2004)				
	Bipp et al. (2008)	+	0	University	
	Steinmayr et al. (2011)	0	0	High school / gymnasium	
	Chen & Zhang (2011)	+	+	High school	
	Wang & Erdheim (2007)	+	0	Adults	
Agreeableness	(6)	+++++	---		In total
	McCabe et al. (2013)	+	-	College	
	Zweig & Webster (2004)	+	0	College	
	Bipp et al. (2008)	+	0	University	
	Steinmayr et al. (2011)	+	--	High school / gymnasium	
	Chen & Zhang (2011)	+	0	High school	
	Wang & Erdheim (2007)	0	0	Adults	
Neuroticism	(6)	--	+++++		In total
	McCabe et al. (2013)	0	+	College	
	Zweig & Webster (2004)	-	++	College	
	Bipp et al. (2008)	0	+	University	
	Steinmayr et al. (2011)	0	0	High school / gymnasium	
	Chen & Zhang (2011)	-	0	High school	
	Wang & Erdheim (2007)	0	+	Adults	

- = small negative significant correlation

-- = large negative significant correlation

+ = small positive significant correlation

++ = large positive significant correlation

0 = no correlation or small non-significant correlation

Appendix C

Table 8 (full versions of Table 4). Traits in relation to test results: Intelligence test, language test and math/science test

Personality trait	Studies	Intelligence (IQ)	Language test	Math/science test	Academic level	Comments
Openness	(15/4/2)	+++++++ +++++++	++++++	+++		In total
	Conard (2006)	+			College	SAT
	Di Blas & Carraro (2011)	++			Elementary school	Raven
	Dollinger et al. (2008)		+		College	Verbal ability
	Spengler et al. (2013)	+	+	+	15-year old	
	Zuffiano et al. (2013)	+			Secondary school	Eighth grade
	Chomorro-Premuzic & Furnham (2008)	+/0			University	IQ/*gf*
	Furnham & Bachtiar (2008)	+			Age 13-15 (and adults)	
	Busato et al. (2000)	++			University	
	Furnham & Monsen (2009)	0			Secondary school	
	Lubbers et al. (2010)		++	++	Secondary school	Average age 13
	Steinmayr et al. (2011)	+			High school / gymnasium	
	Rosander & Bäckström (2012)	+			Secondary school	Only girls
	Rosander & Bäckström (2012)	0			Secondary school	Only boys
	Neuenschwander et al. (2013)		++		Primary school	First and second grade
	Furnham et al. (2008)	++			University	General knowledge
	Von Stumm & Furnham (2012)	0			University	
	Rosander et	+			High school /

		al. (2011)				gymnasium	
Conscientiousness	(14/4/2)	+++++/--	+/-	-			In total
	Conard (2006)	0				College	SAT
	Di Blas & Carraro (2011)	++				Elementary school	Raven
	Dollinger et al. (2008)		0			College	Verbal ability
	Spengler et al. (2013)	0	0	0		15-year old	
	Zuffiano et al. (2013)	-				Secondary school	Eighth grade
	Chomorro-Premuzic & Furnham (2008)	0/-				University	IQ/gf
	Furnham & Bachtiar (2008)	0				Age 13-15 (and adults)	
	Busato et al. (2000)	+				University	
	Furnham & Monsen (2009)	0				Secondary school	
	Lubbers et al. (2010)		-	-		Secondary school	Average age 13
	Steinmayr et al. (2011)	0				High school / gymnasium	
	Rosander & Bäckström (2012)	+				Secondary school	Only girls
	Rosander & Bäckström (2012)	0				Secondary school	Only boys
	Neuenschwander et al. (2013)		+			Primary school	First and second grade
	Furnham et al. (2008)	0				University	General knowledge
	Von Stumm & Furnham (2012)	+				University	
	Rosander et al. (2011)	0				High school / gymnasium	
Extraversion	(15/4/2)	----	+/-				In total
	Conard (2006)	0				College	SAT

	Di Blas & Carraro (2011)	0			Elementary school	Raven
	Dollinger et al. (2008)		-		College	Verbal ability
	Spengler et al. (2013)	0	0	0	15-year old	
	Zuffiano et al. (2013)	0			Secondary school	Eighth grade
	Chomorro-Premuzic & Furnham (2008)	0/0			University	IQ/gf
	Furnham & Bachtiar (2008)	-			Age 13-15 (and adults)	
	Busato et al. (2000)	0			University	
	Furnham & Monsen (2009)	-			Secondary school	
	Lubbers et al. (2010)		+	0	Secondary school	Average age 13
	Steinmayr et al. (2011)	0			High school / gymnasium	
	Rosander & Bäckström (2012)	0			Secondary school	Only girls
	Rosander & Bäckström (2012)	-			Secondary school	Only boys
	Neuenschwander et al. (2013)		0		Primary school	First and second grade
	Furnham et al. (2008)	0			University	General knowledge
	Von Stumm & Furnham (2012)	0			University	
	Rosander et al. (2011)	-			High school / gymnasium	
Agreeableness	(15/4/2)	++	++/-	+/-		In total
	Conard (2006)	0			College	SAT
	Di Blas & Carraro (2011)	0			Elementary school	Raven
	Dollinger et al. (2008)		-		College	Verbal ability

Spengler et al. (2013)	0	0	-	15-year old	
Zuffiano et al. (2013)	0			Secondary school	Eighth grade
Chomorro-Premuzic & Furnham (2008)	0/0			University	IQ/*gf*
Furnham & Bachtiar (2008)	0			Age 13-15 (and adults)	
Busato et al. (2000)	0			University	
Furnham & Monsen (2009)	+			Secondary school	
Lubbers et al. (2010)		++	+	Secondary school	Average age 13
Steinmayr et al. (2011)	0			High school / gymnasium	
Rosander & Bäckström (2012)	+			Secondary school	Only girls
Rosander & Bäckström (2012)	0			Secondary school	Only boys
Neuenschwander et al. (2013)		0		Primary school	First and second grade
Furnham et al. (2008)	0			University	General knowledge
Von Stumm & Furnham (2012)	0			University	
Rosander et al. (2011)	0			High school / gymnasium	
Neuroticism (15/4/2)		--	-		In total
Conard (2006)	0			College	SAT
Di Blas & Carraro (2011)	0			Elementary school	Raven
Dollinger et al. (2008)		0		College	Verbal ability
Spengler et al. (2013)	0	0	-	15-year old	
Zuffiano et al. (2013)	0			Secondary school	Eighth grade

Chomorro-Premuzic & Furnham (2008)	0/0			University	IQ/*gf*
Furnham & Bachtiar (2008)	0			Age 13-15 (and adults)	
Busato et al. (2000)	0			University	
Furnham & Monsen (2009)	0			Secondary school	
Lubbers et al. (2010)		-	0	Secondary school	Average age 13
Steinmayr et al. (2011)	0			High school / gymnasium	
Rosander & Bäckström (2012)	0			Secondary school	Only girls
Rosander & Bäckström (2012)	0			Secondary school	Only boys
Neuenschwander et al. (2013)		-		Primary school	First and second grade
Furnham et al. (2008)	0			University	General knowledge
Von Stumm & Furnham (2012)	0			University	
Rosander et al. (2011)	0			High school / gymnasium	

- = small negative significant correlation

-- = large negative significant correlation

+ = small positive significant correlation

++ = large positive significant correlation

0 = no correlation or small non-significant correlation

SAT = Scholastic Assessment Test (readiness for collage/university studies)

Appendix D

Table 9 (full version of Table 5). Grades: Grade Point Average (GPA), language grades and math/science grades

Personality trait	Studies	GPA	Language grade	Math/science grade	Academic level	Comments
Openness	(26/6/6)	++++++++++ ++++++++++ +	++++++	-		In total
	Mervielde et al. (1994)	++			Elementary school	First to sixth year
	Conard (2006)	0			College	
	Paunonen & Ashton (2001)	0			College	The study only included O +C
	Dollinger et al. (2008)	0			College	
	Hirsh & Peterson (2008)	0			College	
	Spengler et al. (2013)	0	+	0	15-year old	
	Bidjerano & Dai (2007)	++			College	
	Zuffiano et al. (2013)	++			Secondary school	Sixth and eighth grade
	Hakimi et al. (2011)	+			College	
	Laidra et al. (2007)	++			Primary school	Second to fourth grade
	Laidra et al. (2007)	+			Secondary school	sixth to tenth grade
	Di Fabio & Busoni (2007)	+			College	
	Chomorro-Premuzic & Furnham (2008)	+			University	
	Busato et al. (2000)	0			University	
	Lounsbury et al. (2003)	+			Secondary school	Seventh grade
	Furnham & Monsen (2009)	0	0	0	Secondary school	
	Komarraju et al. (2009)	+			College	
	Lubbers et al. (2010)		0	-	Secondary school	Average age 13
	Steinmayr et al. (2011)	+			High school / gymnasium	
	Rosander & Bäckström (2012)	+	++	0	Secondary school	Only girls
	Rosander & Bäckström (2012)	0	+	0	Secondary school	Only boys

	Neuenschwander et al. (2013)	++			Primary school	First and second grade
	Zsolnai (2002)	+			Secondary school	Sixth and tenth grade
	Swanberg & Martinsen (2010)	+			University	
	Rosander et al. (2011)		++	0	High school / gymnasium	
	Kappe & van der Flier (2010)	0			University	
	Nguyen et al. (2006)	0			University	
	Barthelemy & Lounsbury (2009)	+			Secondary school	Eighth grade
Conscientiousness	(28/6/6)	++++++++++ ++++++++++ ++++++++++ ++++++++++ ++++	+++++++	+++++++		In total
	Mervielde et al. (1994)	++			Elementary school	First to sixth year
	Conard (2006)	++			College	
	Paunonen & Ashton (2001)	+			College	The study only included O +C
	Dollinger et al. (2008)	+			College	
	Hirsh & Peterson (2008)	++			College	
	Spengler et al. (2013)	++	+	+	15-year old	
	Bidjerano & Dai (2007)	+			College	
	Zuffiano et al. (2013)	0/+			Primary school	Sixth / eighth grade
	Hakimi et al. (2011)	++			College	
	Laidra et al. (2007)	+			Primary school	Second to fourth grade
	Laidra et al. (2007)	++			Secondary school	sixth to tenth grade
	Di Fabio & Busoni (2007)	++			College	
	Chomorro-Premuzic & Furnham (2008)	++			University	
	Busato et al. (2000)	++			University	
	Lounsbury et al. (2003)	++			Secondary school	Seventh grade

	Furnham & Monsen (2009)	+	+	+	Secondary school	
	Komarraju et al. (2009)	++			College	
	Lubbers et al. (2010)		+	+	Secondary school	Average age 13
	Steinmayr et al. (2011)	++			High school / gymnasium	
	Rosander & Bäckström (2012)	++	++	++	Secondary school	Only girls
	Rosander & Bäckström (2012)	0	+	+	Secondary school	Only boys
	Neuenschwander et al. (2013)	+			Primary school	First and second grade
	Zsolnai (2002)	+			Secondary school	Sixth and tenth grade
	Swanberg & Martinsen (2010)	++			University	
	Smrtnik-Vitulic & Zupancic (2011)	++			Secondary school	Last grade
	Rosander et al. (2011)		+	+	High school / gymnasium	
	Kappe & van der Flier (2010)	++			University	
	Nguyen et al. (2006)	++			University	
	Barthelemy & Lounsbury (2009)	++			Secondary school	Eighth grade
Extraversion	(26/6/6)	++++/----	+/----	-----		In total
	Mervielde et al. (1994)	+			Elementary school	First to sixth year
	Conard (2006)	0			College	
	Dollinger et al. (2008)	0			College	
	Hirsh & Peterson (2008)	0			College	
	Spengler et al. (2013)	0	0	0	15-year old	
	Bidjerano & Dai (2007)	0			College	
	Zuffiano et al. (2013)	0			Primary school	Sixth and eighth grade
	Hakimi et al. (2011)	-			College	
	Laidra et al. (2007)	0			Primary school	Second to fourth grade
	Laidra et al. (2007)	0			Secondary school	sixth to tenth grade

	Di Fabio & Busoni (2007)	0			College	
	Chomorro-Premuzic & Furnham (2008)	0			University	
	Busato et al. (2000)	0			University	
	Lounsbury et al. (2003)	+			Secondary school	Seventh grade
	Furnham & Monsen (2009)	-	--	--	Secondary school	
	Komarraju et al. (2009)	0			College	
	Lubbers et al. (2010)		+	-	Secondary school	Average age 13
	Steinmayr et al. (2011)	0			High school / gymnasium	
	Rosander & Bäckström (2012)	0	0	0	Secondary school	Only girls
	Rosander & Bäckström (2012)	0	-	-	Secondary school	Only boys
	Neuenschwander et al. (2013)	0			Primary school	First and second grade
	Zsolnai (2002)	+			Secondary school	Sixth and tenth grade
	Swanberg & Martinsen (2010)	0			University	
	Smrtnik-Vitulic & Zupancic (2011)	--			Secondary school	Last grade
	Rosander et al. (2011)		-	-	High school / gymnasium	
	Kappe & van der Flier (2010)	0			University	
	Nguyen et al. (2006)	0			University	
	Barthelemy & Lounsbury (2009)	+			Secondary school	Eighth grade
Agreeableness	(26/6/6)	+++++++++	+++++	++		In total
	Mervielde et al. (1994)	0			Elementary school	First to sixth year
	Conard (2006)	0			College	
	Dollinger et al. (2008)	0			College	
	Hirsh & Peterson (2008)	0			College	
	Spengler et al. (2013)	0	0	0	15-year old	
	Bidjerano & Dai (2007)	+			College	

Zuffiano et al. (2013)	0			Primary school	Sixth and eighth grade
Hakimi et al. (2011)	+			College	
Laidra et al. (2007)	++			Primary school	Second to fourth grade
Laidra et al. (2007)	+			Secondary school	sixth to tenth grade
Di Fabio & Busoni (2007)	0			College	
Chomorro-Premuzic & Furnham (2008)	0			University	
Busato et al. (2000)	0			University	
Lounsbury et al. (2003)	+			Secondary school	Seventh grade
Furnham & Monsen (2009)	0	0	0	Secondary school	
Komarraju et al. (2009)	+			College	
Lubbers et al. (2010)		++	+	Secondary school	Average age 13
Steinmayr et al. (2011)	0			High school / gymnasium	
Rosander & Bäckström (2012)	+	++	+	Secondary school	Only girls
Rosander & Bäckström (2012)	0	0	0	Secondary school	Only boys
Neuenschwander et al. (2013)	0			Primary school	First and second grade
Zsolnai (2002)	+			Secondary school	Sixth and tenth grade
Swanberg & Martinsen (2010)	0			University	
Smrtnik-Vitulic & Zupancic (2011)	0			Secondary school	Last grade
Rosander et al. (2011)		+	0	High school / gymnasium	
Kappe & van der Flier (2010)	0			University	
Nguyen et al. (2006)	0			University	
Barthelemy & Lounsbury (2009)	+			Secondary school	Eighth grade
Neuroticism	**(27/6/6)**	---------	+/-	----		**In total**
Mervielde et al. (1994)	-/0			Elementary school	First and second year / third to sixth year
Conard (2006)	0			College	

Study	Col1	Col2	Col3	Level	Grade
Dollinger et al. (2008)	0			College	
Hirsh & Peterson (2008)	0			College	
Spengler et al. (2013)	0	0	0	15-year old	
Bidjerano & Dai (2007)	-			College	
Zuffiano et al. (2013)	0			Primary school	Sixth and eighth grade
Hakimi et al. (2011)	-			College	
Laidra et al. (2007)	-			Primary school	Second to fourth grade
Laidra et al. (2007)	-			Secondary school	sixth to tenth grade
Di Fabio & Busoni (2007)	0			College	
Chomorro-Premuzic & Furnham (2008)	0			University	
Busato et al. (2000)	0			University	
Lounsbury et al. (2003)	-			Secondary school	Seventh grade
Furnham & Monsen (2009)	-	-	--	Secondary school	
Komarraju et al. (2009)	0			College	
Lubbers et al. (2010)		0	-	Secondary school	Average age 13
Steinmayr et al. (2011)	-			High school / gymnasium	
Rosander & Bäckström (2012)	0	0	-	Secondary school	Only girls
Rosander & Bäckström (2012)	0	0	0	Secondary school	Only boys
Neuenschwander et al. (2013)	-			Primary school	First and second grade
Zsolnai (2002)	0			Secondary school	Sixth and tenth grade
Swanberg & Martinsen (2010)	0			University	
Smrtnik-Vitulic & Zupancic (2011)	0			Secondary school	Last grade
Rosander et al. (2011)		+	0	High school / gymnasium	
Kappe & van der Flier (2010)	0			University	
Nguyen et al. (2006)	0			University	

| Barthelemy & Lounsbury (2009) | 0 | | Secondary school | Eighth grade |

- = small negative significant correlation

-- = large negative significant correlation

+ = small positive significant correlation

++ = large positive significant correlation

0 = no correlation or small non-significant correlation

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