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# Personality and school functioning of intellectually gifted and nongifted adolescents: Self-perceptions and parents' assessments

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ABSTRACT

Ambivalent stereotypes of the gifted still persist in the public. The aim of the current study is to provide a holistic picture of the personality (Big Five) and school functioning (motivation: academic self-concept, school values, achievement motives, achievement goals; grades; general knowledge) of gifted and non-gifted adolescents via self-reports and external assessments from their parents. Moreover, this is one of the first studies examining self-rated intelligence results and results from an objective intelligence test simultaneously. The sample comprised $N = 760$ students from five schools (age: $M = 16.66$, $SD = 0.68$; $n = 411$ female). Intellectual giftedness was defined as having an IQ two standard deviations above the mean value. We used propensity score matching to draw a comparable control group of nongifted adolescents (covariates: age, gender, and socioeconomic background; both groups $n = 97$). Gifted adolescents scored higher regarding openness to experience and had better grades, reported higher motivation, and evaluated themselves as more intelligent than nongifted adolescents. Parents of gifted adolescents rated their children higher on motivation, intelligence, and general knowledge than parents of nongifted adolescents. Taken together, we found no hints that gifted adolescents display any anomalies regarding personality, motivation, or school success.

In giftedness research, there has always been enormous interest in whether gifted individuals are different from nongifted individuals regarding their personality, behavior, mental health, or educational adjustment. It has frequently been postulated that intellectual giftedness might be a risk factor for the development of psychosocial or emotional problems (e.g., Gross, 1994; Neihart, 1999; Winner, 2000). Gifted children might feel that they are different from other (nongifted) children and, hence, might have more stress than others, which in turn might lead to the development of mental health or behavioral problems (Neihart, 1999). This assumption refers to the *disharmony hypothesis* (Gallagher, 1990), which proposes that deficiencies concerning psychosocial adjustment and mental health are due to giftedness. The public press, in particular, is full of reports associating giftedness with school failure, depression, or loneliness (Baudson, 2016).

In his outstanding longitudinal study, Terman (1925) was one of the first to investigate intellectually gifted individuals empirically. He found evidence that the gifted are characterized by a balanced personality profile, high achievement motivation, and excellent educational accomplishments. These results refer to the *harmony hypothesis* (Sternberg & Davidson, 2005), which proposes that gifted individuals are not only more successful in school or in their careers than nongifted individuals but are also emotionally and socially well adjusted (Plucker & Callahan, 2008). Ample research has focused on the mental health of gifted children and adolescents (Francis, Hawes, & Abbott, 2016; Martin, Burns, & Schonlau, 2010; Rost, 2009) and studies have shown a favorable mental health development for intellectually gifted children and adolescents, supporting the harmony hypothesis (Plucker & Callahan, 2008). Other areas of adjustment besides mental health such as personality or educational functioning (e.g., motivation) have been investigated less frequently (e.g., Preckel, Götz, Pekrun, & Kleine, 2008). Moreover, results have by no means been homogeneous, which in part might be explained by varying definitions and operationalizations of intellectual giftedness. Further, many studies on giftedness lack matched nongifted comparison groups (Dai, Swanson, & Cheng, 2011; Preckel & Krampen, 2016), use case studies or very small samples, as well as preselected students from gifted programs (Martin et al., 2010). The study of highly selective gifted samples (e.g., gifted individuals with behavioral problems or from a counseling center) and the lack of control groups might be important reasons for why the disharmony hypothesis and negative stereotypes about the gifted persist in society

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(e.g., Baudson, 2016; Baudson & Preckel, 2013). One possibility to undo stereotypes refers to enhancing knowledge about the stereotype (Ajzen, 1991; Matheis, Kronborg, Schmitt, & Preckel, 2018). Hence, more methodologically sound research on the development and adjustment of gifted individuals is needed to enhance the knowledge about gifted individuals to undo these stereotypes.

The aim of the current study was to investigate possible similarities and/or differences between intellectually gifted and nongifted adolescents with regard to a multitude of variables covering their personality, motivation, and school adjustment. Thereby, we aimed to overcome the aforementioned methodological shortcomings of missing control groups and the use of preselected gifted samples. Another objective was to go beyond examining self-perceptions of intellectually gifted and nongifted adolescents by also examining parents' perceptions to explore whether perceptions differ between the families of the two groups. Given the prevalent stereotype of intellectual giftedness in line with the disharmony hypothesis (Baudson & Preckel, 2013; Matheis et al., 2018; Preckel, Baudson, Krolak-Schwerdt, & Glock, 2015), the current study was designed to paint a comprehensive picture of intellectually gifted adolescents. We should note that this is one of the few studies to use a multi-informant approach by collecting data not only from the gifted and nongifted themselves but also from their parents (Richards, Encel, & Shute, 2003).

## 1. Defining intellectual giftedness

Several gifts and talents can be differentiated (Olszewski-Kubilius, Subotnik, & Worrell, 2016; Sternberg & Davidson, 2005). Here we focus on intellectual giftedness which has been defined in various ways. Multidimensional models refer to cognitive variables such as intellectual ability as well as to noncognitive variables (e.g., motivation, creativity) to define giftedness (e.g., Gagné, 2005; Renzulli, 2005). Although multidimensional models of giftedness are broadly accepted, they lack information on specific functional relations between model components (Preckel & Vock, 2013), a problem that impedes their use in empirical research studies. This might be one of the reasons why many studies use an unidimensional approach to study intellectual giftedness. Here, intellectual giftedness is frequently conceptualized as a high level of general intelligence *g* (Spearman, 1904, 1927). Both theoretical reasons (e.g., strong associations between intelligence and educational success: Deary, Strand, Smith, & Fernandez, 2007; Gottfredson, 2002) and methodological considerations (e.g., reliable and valid assessment of intelligence, see Robinson, 2005; Rost, 2009; Roznowski, Reith, & Hong, 2000; Thompson & Oehlert, 2010; Warne, 2016; Wirthwein & Rost, 2011a, 2011b) argue for the conceptualization of intellectual giftedness as a high level of *g*. We therefore adopted the definition of intellectual giftedness as being characterized by a high level of *g* (an IQ 2 *SD*s above the mean value; IQ ≥ 130; e.g., Warne, 2016). To provide a framework for our study, we mainly refer to studies that used this definition of intellectual giftedness in the following.

### 1.1. Intellectual giftedness and personality

Within giftedness research, it is frequently assumed that gifted individuals have unique personality dimensions that distinguish them from nongifted individuals. For example, in the context of the "Theory of Positive Disintegration" (e.g., Mendaglio, 2010) gifted individuals are characterized as having an "enhanced and intensified mental activity distinguished by characteristic forms of expression which are above common and average" (Piechowski, Silverman, & Falk, 1985, p. 540; so-called "overexcitabilities"). However, studies with control groups of nongifted adolescents did not support this assumption and show only very small differences between gifted and nongifted individuals (Winkler & Voight, 2016; Wirthwein & Rost, 2011b). Results from the Marburg Giftedness Project (see Rost, 2009; Wirthwein & Rost, 2011a), a longitudinal study ranging from elementary school to adulthood, revealed many similarities between gifted and nongifted adolescents regarding their personality. Of note, in the Marburg Giftedness Project, neither the gifted nor the nongifted participants were informed about their group membership (i.e., gifted or nongifted). By the age of 15, there were either no or only small differences ($d < 0.30$) between the two groups on different personality scales (Freund-Braier, 2009). If anything, the gifted group displayed less obedience to adults ($d = -0.34$) and a higher ambition for school ($d = 0.34$).

Investigating students from a school with gifted classes, Cross, Cassady, Dixon, and Adams (2008) used the Minnesota Multiphasic Personality Inventory-Adolescent (MMPI-A) to study the personality and mental health of gifted adolescents. When compared with the norms provided in the MMPI-A manual, the gifted scored lower than the norm on Psychasthenia ($d = 0.50$) or Schizophrenia ($d = 0.48$). Sak (2004) summarized the research on psychological types of gifted adolescents. Drawing on 14 studies using the Myers-Briggs Type Indicator (MBTI; Myers & McCaulley, 1985), the author concluded that gifted adolescents were more introverted and intuitive than adolescents from the norm sample. Furthermore, the gifted preferred the thinking dimension (over the feeling dimension) and the perceiving dimension (over the judging dimension). Unfortunately, information about the number of gifted adolescents was missing and, in general, the MBTI does not demonstrate adequate reliability or validity (Kline, 1995). The previously listed studies refer to different personality traits and models and it is difficult to compare the results of these studies.

The five-factor model of personality with the Big Five factors of Neuroticism (traits related to emotional instability including anxiety and sadness), Extraversion (traits related to sociability, energy, and activity), Openness to Experience (a wide range of interests, being open-minded), Agreeableness (prosocial behavior toward others), and Conscientiousness (being organized, having high levels of thoughtfulness) is one of the most prominent and well-established personality framework (McCrae & John, 1992). There are several studies that have explored the relations between intelligence and the five-factor model. A meta-analysis by Ackerman and Heggestad (1997; see also Poropat, 2009) found positive correlations between general intelligence and Openness to Experience ($r = 0.33$). Negligible associations with intelligence ($r \leq 0.15$) were found for the remaining Big Five factors (see also DeYoung, 2011). However, because the disharmony hypothesis assumes differences regarding extreme groups, studies focusing on gifted vs. nongifted individuals have to be taken into account as well. Only a few studies with gifted samples have focused on the Big Five. In a study by Zeidner and Shani-Zinovich (2011), gifted adolescents scored significantly higher on Openness to Experience ($d = 0.51$) and lower on Neuroticism ($d = -0.26$; see also McCrae, Costa, Parker, & Mills, 2002) than the nongifted control group. In addition, the gifted students scored significantly lower on Agreeableness ($d = -0.28$). No differences were found for Extraversion and Conscientiousness. Limont, Dreszer-Drogorób, Bedyńska, Śliwińska, and Jastrzębska (2014) found similar results with gifted students scoring lower on Neuroticism ($d = -0.72$) and higher on Openness to Experience ($d = 0.56$) than nongifted students. However, it has to be taken into account that the gifted students in both studies were members of gifted programs and were thus preselected. Both studies did not report how the control group was recruited. Furthermore, the matching was not optimal (e.g., gender, a factor known to be related to personality, was not controlled for). Cross et al. (2008) and Sak (2004) compared the gifted with norms from test manuals. Although there are some advantages regarding the use of norm samples (e.g., standardized assessment, sufficient sample sizes) there are also some disadvantages. Norm samples usually have greater variability than groups of gifted students and probably include the gifted themselves (Freund-Braier, 2009; Olszewski-Kubilius, Kulieke, & Krasney, 1988). It is unknown if norm samples are comparable to the gifted sample under study concerning socioeconomic background, age, or gender. These methodological shortcomings might have contributed to the heterogeneity of findings. In sum, there is no

study comparing gifted adolescents with a matched control group regarding age, gender, or socio-economic background on the five-factor model.

### 1.2. Intellectual giftedness, school adjustment, and motivation

Given the substantial associations between intelligence and academic achievement ($0.40 \leq r \leq 0.70$; e.g., Kuncel, Hezlett, & Ones, 2004; Leeson, Ciarrochi, & Heaven, 2008), it is not surprising that, on average, intellectually gifted students have better school grades and greater academic accomplishments than their nongifted peers (Lubinski, 2016). Within the Marburg Giftedness Project (Rost, 2009), in elementary school the grade point average (GPA) of gifted students was > 1.5 *SD*s better than the GPA of the matched control group of nongifted students (Rost & Hanses, 1997; see also Vialle, Hewven, & Ciarrochi, 2008).

Different achievement indicators such as school grades are strongly associated with academic self-concept ($r = 0.42$; Hansford & Hattie, 1982; Möller, Pohlmann, Köller, & Marsh, 2009) also within gifted classes (Preckel et al., 2017). The term academic self-concept refers to perceptions about oneself in academic achievement situations and is most often conceptualized as domain-specific (e.g., mathematical or English self-concept; see Marsh & Shavelson, 1985). Concerning the academic self-concept of gifted students, it is assumed that gifted students display higher academic self-concepts than nongifted students due to their higher academic achievement (Hoge & Renzulli, 1993). Methodologically sound research has supported this assumption. A meta-analysis by Litster and Roberts (2011) found evidence that gifted students rate their own academic competencies higher than nongifted students ($d = 0.50$; see also Dai, Moon, & Feldhusen, 1998; Hoge & Renzulli, 1993; Wirthwein, Peipert, Hanses, & Rost, 2011; Zeidner & Shani-Zinovich, 2015). Focusing on domain-specific self-concepts, gifted adolescents report in particular higher self-concepts in mathematics than nongifted students ($d = 1.00$; self-concept in German $d = 0.24$; Rost & Hanses, 2009; see also Preckel et al., 2008). Results on estimates of other abilities comparing gifted and nongifted students are rare. To our knowledge, there is no study with gifted students and matched controls regarding students' perceived competence of different intelligence facets. Due to the fact that intelligence self-estimates play an important role in academic achievement in adolescence (e.g., Bipp, Steinmayr, & Spinath, 2012; Steinmayr, Wirthwein, & Schöne, 2014) and are correlated with actual intelligence (cf. Freund & Kasten, 2012), we would expect gifted students to score higher on (different facets of) self-perceived intelligence than nongifted students.

In comparison to the number of studies focusing on gifted students' academic self-concept, studies focusing on other motivational variables are scarce. There are several motivational constructs that are important for learning and academic achievement and have shown incremental validity over and above intelligence in predicting achievement (e.g., achievement goals, achievement motives, interest, importance, utility; Steinmayr & Spinath, 2009a). Hence, it is important to additionally investigate whether intellectually gifted students differ from nongifted students on these constructs.

Gottfried and Gottfried (1996) suggested that intellectually gifted students might feel more joy when learning and that intrinsic motivation should be relevant for transforming intellectual capacity into performance. Moreover, it has been suggested that intellectually gifted students might seek more cognitive challenges than nongifted students, and this, in turn, might result in greater intrinsic motivation (Schick & Phillipson, 2009). Within the Fullerton Longitudinal Study, Gottfried and Gottfried (1996) found that gifted children scored significantly higher than a matched control group on intrinsic motivation regarding different school subjects.

A motivational construct strongly related to research on intrinsic/extrinsic motivation is that of achievement goals. The theory of achievement goals is aimed at explaining and predicting the direction and intensity of an individual's behavior in achievement situations (Elliot, 1999). Different achievement goals can be distinguished, for example, mastery goals (i.e., the aim to develop one's competence), performance-approach goals (i.e., the aim to demonstrate high competences and to outperform others), and performance-avoidance goals (i.e., the aim to avoid appearing incompetent and to avoid doing worse than others; Elliot & Church, 1997). Results regarding the achievement goals of intellectually gifted students have been mixed. For mastery goals, either no (Preckel et al., 2008; Ziegler, Heller, & Broome, 1996) or slightly higher scores for gifted students were found (Marzooghi, Sheikholeslami, & Shamshiri, 2009). Other studies that have focused on motivational constructs (e.g., achievement motivation, causal attribution) have, again, suffered from several methodological shortcomings such as highly preselected samples or missing comparison groups (e.g., Al-Dhamit & Kreishan, 2016; Chan, 1988, 2008; Gentry, Gable, & Springer, 2000).

### 1.3. Personality, school adjustment, and motivation: parents' assessments

As already mentioned, several myths and ambivalent stereotypes are associated with giftedness (Baudson, 2016; Preckel et al., 2015): Gifted individuals are frequently seen as maladjusted due to their high intellectual potential. In this context, different “checklists” about the gifted are circulating, focusing on different behavior patterns or personality characteristics that gifted children and adolescents allegedly have, such as a high degree of energy or perfectionism (e.g., Silverman, Chitwood, & Waters, 1986). Parents might suppose that their child is gifted due to the behavioral patterns listed in such a checklist. However, it is not possible to identify an intellectually gifted child with checklist items (Perleth, Preckel, Denstädt, & Leithner, 2008). In this context, research comparing assessments of parents of gifted children with assessments of parents' of nongifted children will offer important insights (e.g., regarding the question of whether gifted children are rated differently by their parents than nongifted children). Studies on parents' assessments of gifted children are extremely rare. Some research has focused on parents who have consulted a counseling center for their gifted children (e.g., Fridrici, 2002; McGuffog, Feiring, & Lewis, 1987; Morawska & Sanders, 2008; Scott, Deuel, Perou, Jean-Francois, & Urbano, 1999). However, the results of these studies are based on a preselection of rather problematic children and cannot be generalized to the gifted.

Research from the Marburg Giftedness Project (Schilling, Sparfeldt, & Rost, 2006) revealed that parents of gifted adolescents evaluated the cognitive abilities of their children higher than parents of nongifted adolescents (mothers: $d = 0.55$; fathers: $d = 0.58$). No differences ($d < 0.30$) were found regarding social-emotional skills, social competence, autonomy, and uncertainty. It is worth mentioning that the parents did not know which group (gifted or nongifted) their child belonged to.

Richards et al. (2003) found that the parents of gifted children rated their child as less anxious ($d = -0.56$) and as having fewer attention problems ($d = -0.67$) than parents of nongifted children. In addition, gifted children were rated lower on the mean score of the behavior checklist applied ($d = -0.57$). The results underpin the idea that parents of gifted children and adolescents do not see their child as more problematic than parents of nongifted children and adolescents. If differences were found, they were in favor of the gifted.

## 2. Aim of the current study and hypotheses

Our study was designed to provide a comprehensive overview of the personality and school functioning of intellectually gifted adolescents in comparison with nongifted adolescents. Recently published studies frequently focused on different indicators of psychological well-being of gifted children and adolescents (e.g., Bergold, Wirthwein, Rost, & Steinmayr, 2015; Francis et al., 2016) but research on personality and

school adjustment is still scarce. Therefore, we aimed to fill the research gap with regard to gifted adolescents' personality (Big Five) and school adjustment (especially focusing on several different motivational variables), using samples from regular schools and an appropriate matching technique. In addition to self-report data, we asked parents to rate their children's personality and school functioning.

### 2.1. Big Five

Although some research has compared gifted and nongifted individuals on various personality variables, no study has focused on the well-established five-factor model (McCrae & John, 1992) by investigating appropriately matched samples. Taking into account correlational studies (Ackerman & Heggestad, 1997) and studies by Zeidner and Shani-Zinovich (2011) and Limont et al. (2014), we specified the following hypotheses.

**Hypothesis 1.** Intellectually gifted students score higher than nongifted students on Openness to Experience.

**Hypothesis 2.** Intellectually gifted students score lower on Neuroticism.

### 2.2. School performance

Numerous studies have focused on the educational accomplishments of intellectually gifted students (e.g., Lubinski, 2016; Rost & Hanses, 1997; Roznowski et al., 2000; Vialle et al., 2008). Correlational associations between intelligence and academic achievement have shown high associations between school grades and intelligence (e.g., Kuncel et al., 2004). As the highest correlations between grades in mathematics and intelligence emerged (Roth et al., 2015), we expected

**Hypothesis 3.** Intellectually gifted adolescents have better school grades than nongifted adolescents, especially in mathematics.

### 2.3. Self-perceived intellectual abilities, self-perceived knowledge, and motivation

Several studies have revealed that intellectually gifted adolescents display higher academic self-concepts than nongifted adolescents (e.g., Litster & Roberts, 2011). The differences between the two groups are especially large in the domain of mathematics (Rost & Hanses, 2009). In this context, we assumed that

**Hypothesis 4.** Gifted individuals have higher academic self-concepts in mathematics and German than non-gifted adolescents.

As no study has yet focused on the perceived intellectual competencies of intellectually gifted students, another aim of the current study was to examine how intellectually gifted (vs. nongifted) students would rate their own intellectual abilities (e.g., verbal or numerical intelligence, knowledge in different domains). Given their superior academic performance which is an important source of intelligence self-estimations (Ackerman & Wolman, 2007) we expected that

**Hypothesis 5.** Intellectually gifted students rate their intellectual competencies and their knowledge higher than nongifted students.

Studies focusing on other motivational variables such as achievement motives, values, or achievement goals are rare (but see Preckel et al., 2008). For the current study, we concentrated on three of the most prominent motivational approaches: Achievement theory, expectancy-value theory, and achievement goal theory (Murphy & Alexander, 2000). Given the above summarized results concerning these motivational constructs, we hypothesized that

**Hypothesis 6.** Intellectually gifted students show a higher hope for success and a lower fear of failure than nongifted students.

**Hypothesis 7.** Intellectually gifted students have higher school values than nongifted students.

Furthermore, due to the lack of research, we investigated the following research question: Do intellectually gifted students differ regarding achievement goals (mastery, performance-approach, performance-avoidance, and work-avoidance goals)?

### 2.4. Parents' assessments

As already pointed out by Richards et al. (2003), almost all studies have focused on the self-perceptions of intellectually gifted adolescents. Parents' ratings are an important supplement, as they can provide valuable additional information about the adjustment of gifted adolescents. On the basis of the few studies on this topic (Richards et al., 2003; Schilling et al., 2006) and the Eccles et al. model on academic achievement that postulates a direct link from achievement experience on socializers' beliefs concerning a child (Wigfield & Eccles, 2000), we expected that

**Hypothesis 8.** Ratings of parents of gifted adolescents regarding adolescents' school functioning (academic and intellectual abilities, knowledge, motivation) will be more favorable than rating of parents of nongifted adolescents.

No previous study has focused on the agreement and discrepancy between the ratings of parents and children while additionally focusing on group membership (gifted/nongifted). Hence, we examined whether the agreement and discrepancies between the ratings of parents with gifted children and ratings of the gifted children on the one hand and the agreement and discrepancy between the ratings of parents with nongifted children and the ratings of nongifted children on the other hand differ.[1]

## 3. Method

### 3.1. Participants

The sample comprised $N = 760$ students (411 girls; 54.1%) recruited from five different schools in two federal states in Germany between 2005 and 2008. All students were enrolled in a Gymnasium. The Gymnasium is the highest track in the German secondary school system and the option most frequently chosen for receiving the Abitur, a school-leaving certificate that is mandatory for university enrollment. After finishing elementary school (fourth grade), students are selected for one of several different school tracks. Most of the well-performing students are selected for the Gymnasium (Sparfeldt, Schilling, & Rost, 2006). Thus, students attending a Gymnasium are, on average, better performing and somewhat above average in intelligence (see Steinmayr, Beauducel, & Spinath, 2010). Consequently, the prevalence of gifted students is higher in Gymnasium samples than in the entire student population. Therefore, Gymnasium students actually are a somewhat preselected group. However, they are not as strongly preselected as, for example, students attending special gifted classes or gifted programs. For example, between 2005 and 2008, the proportion of students attending the Gymnasium was about 43% of the entire respective cohort; e.g., Statistisches Bundesamt (2010). The mean IQ of the students in the present sample was $M = 111.8$ ($SD = 9.8$). The students in the present study attended either the 11th or 12th grade and were on average $M = 16.66$ ($SD = 0.68$) years of age. Between 2005 and 2008, the girls-to-boys ratio among students in Gymnasiums was about 54:46 (e.g., Statistisches Bundesamt, 2010). Thus, the proportion of girls and boys in the present sample was representative of this

[1] We thank one anonymous reviewer for the suggestion to examine agreement and discrepancy measures.

student population at the time when testing took place.

In addition to the students' self-reports, we also asked the students' parents to evaluate the students' personality, motivation, as well as intelligence and knowledge indicators. One parent answered the parent assessment. Parents could choose whether the mother or father would provide the assessment. We received assessments from 533 parents (70.1% of the total sample); 296 mothers and 237 fathers participated. Mothers were on average $M = 45.75$ ($SD = 4.50$) years old, and fathers were on average $M = 48.58$ ($SD = 4.93$) years old. The socioeconomic status (SES) of the mothers and fathers as indicated by the International Socio-Economic Index of Occupational Status (ISEI) was average. On the ISEI scale from 16 to 90 (with higher values indicating higher SES), the score was $M = 49.25$ ($SD = 11.40$) for the mothers and $M = 52.09$ ($SD = 15.38$) for the fathers.

### 3.2. Measures

For some constructs, we collected both students' self-reports and parent assessments. Students' self-reports were based on established scales (see below). For economic reasons, however, the parents' assessments of the children's personality and motivation were done with single-item measures. To allow optimal comparability between parents' assessments and students' self-reports, we asked the students to also rate themselves on those same single items. To assure their validity, we inspected the correlations between the students' ratings on the single items and the students' ratings on the corresponding established scales.

#### 3.2.1. Data from students

***Intelligence.*** We administered the basic module of the Intelligence-Structure-Test 2000 R (Intelligenz-Struktur-Test 2000 R; IST 2000 R; Liepmann, Beauducel, Brocke, & Amthauer, 2007). This test is based on Thurstone's and Cattell's intelligence theories and measures verbal, numerical, and figural reasoning ability. The composite score indicates general reasoning ability, which is closely tied to general intelligence (*g*; see Brand, 1996). The psychometric properties and validity of the IST 2000 R are well-established (e.g., Schmidt-Atzert & Rauch, 2008). Internal consistency in the present study was $\alpha = 0.89$. The test uses a *z*-scaled standardized intelligence score (SIS) with $M = 100$ and $SD = 10$.

***General knowledge.*** We used the general knowledge test of the IST 2000 R. This test is comprised of 84 items covering the six domains geography/history, economics, science, mathematics, arts, and daily life. The test is intended to measure general knowledge. Therefore, all items are summed into one composite score (Liepmann et al., 2007). In the present study, the internal consistency of the composite score was $\alpha = 0.79$.

***Personality.*** We assessed the Big Five (Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness) with the German version of the NEO-FFI (Borkenau & Ostendorf, 1993). The questionnaire consists of 60 items that can be answered on a Likert scale ranging from 1 (*strong rejection*) to 5 (*strong agreement*). Each of the Big Five dimensions was measured with 12 items. Internal consistencies were $\alpha = 0.84$ for Neuroticism, $\alpha = 0.79$ for Extraversion, $\alpha = 0.72$ for Openness, $\alpha = 0.77$ for Agreeableness, and $\alpha = 0.83$ for Conscientiousness.

We also asked the students to additionally provide a self-rating for each of the dimensions on a single item (see above), which was accompanied by a description of the respective construct and which was also administered to their parents (e.g., “Extraversion: Describes a self-confident, active, talkative, energetic, cheerful, and optimistic human being who usually prefers the company of other people over being alone;” “Openness to Experience: Measures how much one is interested in, and deals with, new experiences and impressions”). The single items could be answered on a Likert scale ranging from 1 (*very low on this characteristic*) to 7 (*very high on this characteristic*). The correlations (corrected for attenuation) between the single-item self-ratings and the self-ratings on the NEO scales were $r = 0.47$ for Neuroticism, $r = 0.65$ for Extraversion, $r = 0.21$ for Openness to Experience, $r = 0.40$ for Agreeableness, and $r = 0.56$ for Conscientiousness. Thus, the correlations were rather low. Therefore, findings based on the single items should be considered as tentative.

***Ability self-concepts.*** Ability self-concept for mathematics and German was investigated with four items each. The students were asked to indicate on a 5-point Likert scale how good they thought they were at different activities in mathematics or German (e.g., “In math/German, I know little/a lot”). Internal consistency was $\alpha = 0.95$ for ability self-concept in mathematics and $\alpha = 0.91$ for ability self-concept in German. The construct validity of the measures has already been demonstrated (see Schöne, Dickhäuser, Spinath, & Stiensmeier-Pelster, 2012). Using a single item with a 7-point Likert scale, the students also rated how good they thought they were in mathematics and in German (“Mathematical abilities: To solve mathematical tasks quickly and correctly and to understand new contents in math quickly;” “Abilities in German: To grasp tasks in German quickly, to work on them comprehensively, and to understand new contents in German quickly”). The corrected correlations of the single items with the full scales were $r = 0.92$ (mathematics) and $r = 0.81$ (German) for the students, indicating that these single items had high validity.

***Subjective task values.*** According to the expectancy-value theory (e.g., Wigfield & Eccles, 2000), subjective task values comprise the three components interest, importance, and utility. We assessed these components for mathematics and German with one item each, which could be answered on a 5-point Likert scale (interest: “How much do you like doing mathematics/German?”; importance: “For me, being good at mathematics/German is not at all/very important;” utility: “In general, how useful is what you learn in mathematics/German?”). The construct validity of the measures has already been demonstrated (see Steinmayr & Spinath, 2007, 2009a, 2009b). For both subjects, we calculated the mean of all three items to determine the overall subjective value of each subject. The internal consistency of the overall score was $\alpha = 0.78$ for mathematics and $\alpha = 0.75$ for German. Moreover, we assessed interest in mathematics and German with an additional single item on a 7-point Likert scale (e.g., “I am interested in mathematics.”). The single-item measures of interest were substantially correlated with the overall scores in the student sample, indicating their validity (corrected correlations: $r = 0.89$ for mathematics and $r = 0.62$ for German).

***Achievement motives.*** We assessed hope for success and fear of failure as conceptualized by McClelland, Atkinson, Clark, and Lowell (1953) using the German version of the Achievement Motives Scale (AMS; Gjesme & Nygard, 1970; Göttert & Kuhl, 1980). In the present study, we used a short form with seven items for each achievement motive (e.g., “Difficult problems appeal to me;” “Matters that are slightly difficult disconcert me”). Items could be answered on a Likert scale ranging from 1 (*does not apply at all*) to 4 (*fully applies*). Internal consistency was $\alpha = 0.85$ for hope of success and $\alpha = 0.87$ for fear of failure. In addition to the AMS short scale, students also rated their achievement motivation on a single item (“Achievement motivation: To feel challenged by difficult tasks and to like to work on demanding problems”). The corrected correlation between the students' self-ratings on this item and the students' self-ratings on the full hope for success scale was $r = 0.67$.

***Achievement goals.*** We assessed achievement goals with the Scales for the Assessment of Learning Motivation and Achievement Motivation (Spinath, Stiensmeier-Pelster, Schöne, & Dickhäuser, 2002). This instrument measures mastery goals (8 items; e.g., “In school, it is important to me to learn as much as possible”), performance-approach goals (8 items; e.g., “In school, it is important to me that others think I am smart”), performance-avoidance goals (8 items; e.g., “In school, it is important to me not to give wrong answers to the teacher's questions”), and work avoidance (7 items; e.g., “In school, it is important to me to do as little work as possible”). All items were answered on a Likert scale

ranging from 1 (*totally disagree*) to 5 (*totally agree*). Internal consistencies were α = 0.79 (mastery goals), α = 0.82 (performance-approach goals), α = 0.89 (performance-avoidance goals), and α = 0.89 (work avoidance).

***School performance.*** We assessed school performance via students' grades obtained from the first report cards after the testing sessions. We analyzed grades in mathematics, German, and the composite scores of the grades in science, foreign languages, social sciences, as well as GPA. Grades ranged from 1 (*excellent performance*) to 6 (*insufficient performance*).

***Perceived general knowledge.*** Following the framework of the IST 2000 R knowledge test, we asked the students to indicate on a 7-point Likert scale how high they thought their knowledge was in the domains geography/history, economics, science, mathematics, arts, and daily life compared with their peers (with higher values indicating higher knowledge). To compare the self-assessments with the actual test composite score, we calculated the mean of the self-assessments across all knowledge domains. Internal consistency was α = 0.66.

***Perceived intelligence.*** Following the framework of the IST 2000 R, we asked the students to use a 7-point Likert scale to indicate how good they thought their verbal, numerical, figural, and general reasoning ability would be compared with their peers (single items for each domain with higher values indicating higher ability; the items have been developed by Steinmayr & Spinath, 2009b).

***Sociodemographic data.*** All students reported their gender, age, and parents' qualification levels and professions. We used the parent information to determine the ISEI. We then used the highest ISEI value (HISEI) of the parents as an index of the family's SES.

#### 3.2.2. Data from parents

***Personality.*** The parent assessments were made on the same single items as used for the students for each Big Five dimension. As some of the correlations between the single items and the full scales for the students were low (see above), the parents' ratings of their children's personality should be interpreted with caution.

***Ability self-concepts.*** Using the same single items as the students, parents rated how good they thought their child was in mathematics and in German.

***Interests.*** Using the same single item as the students, parents assessed their child's interests.

***Achievement motivation.*** Using the same single item as the students, parents rated their child's achievement motivation in general.

***Perceived general knowledge.*** We used the same principle as outlined in the student data section for the parent assessments. To compare the parent assessments with the actual test composite score, we calculated the mean of the parent assessments. The internal consistency of this score was α = 0.77.

***Perceived intelligence.*** We used the same principle as outlined in the student data section for the parent assessments of students' verbal, numerical, figural, and overall reasoning ability (cf. Steinmayr & Spinath, 2009b).

### 3.3. Human subjects approval

The students participated voluntarily and could only participate if their parents had provided their written informed consent for participation. All but two parents agreed. Students were informed that they could withdraw from the testing session at any time. Anonymity was guaranteed by the use of codes. The participants in this study did not belong to a vulnerable group, there were no exclusion or inclusion criteria, the participants were not misled as to the purpose of the study, there were no intimate or possibly stigmatizing questions, and there was no intervention causing possible mental or physical harm. In the federal state of North Rhine-Westphalia, a permission of the governing body for the investigation is not required.

### 3.4. Procedure

The testing sessions took place at school during a regular school day and were conducted in groups of about 20 students. Trained research assistants administered the tests according to standardized instructions. The participation rate was about 90%. Some students who had received permission from their parents missed the testing session due to illness or for other reasons that were not related to our investigation. There were no students who opted for not participating: Students doing so would have got an extra assignment by their teacher.

### 3.5. Analyses

#### 3.5.1. Propensity score matching

In order to generate equivalent groups of gifted and nongifted students, we used propensity score matching (PSM; Rosenbaum & Rubin, 1983). To calculate propensity scores, we computed a logistic regression analysis with giftedness (0 = nongifted, 1 = gifted) as the dependent variable. We diagnosed giftedness if a student's standardized intelligence score (SIS) was higher than 120 (i.e., if a student belonged to the upper 2% of the population; equals an IQ > 130). On the basis of their SIS, students were categorized into four groups. The below-average (SIS ≤ 90) group comprised $n = 8$ students (8 girls; $M_{age} = 16.63$ years, $SD_{age} = 0.74$). An average SIS (90 < SIS ≤ 110) was displayed by $n = 529$ students (327 girls; $M_{age} = 16.67$ years, $SD_{age} = 0.68$), and $n = 126$ students (50 girls; $M_{age} = 16.60$ years, $SD_{age} = 0.65$) had above-average intelligence scores (111 ≤ SIS ≤ 120). A subsample of $n = 97$ students (26 girls; $M_{age} = 16.68$ years, $SD_{age} = 0.67$) was categorized as gifted (SIS > 120). For PSM, we used the average SIS group as the comparison group.

Because previous research found gender and SES differences for personality, motivation, and school performance (e.g., OECD, 2014; Steinmayr, Dinger, & Spinath, 2010, 2012; Steinmayr & Spinath, 2008; Voyer & Voyer, 2014), we used these variables as covariates (method: inclusion; Stuart, 2010). Additionally, due to gender differences in intelligence variance, there were somewhat higher percentages of males among the gifted than among the nongifted. Besides, the intellectually gifted more often stem from upper SES households than the nongifted (see, e.g., Rost, 2013). Therefore, to achieve undistorted findings, it was important to match the groups on both gender and SES. Further, as age showed small but statistically significant correlations (0.08 ≤ |*r*| ≤ 0.22) with some of the dependent variables, we also included age as a covariate.

For our analyses, we used 1:1 nearest neighbor matching without replacement. To ensure the quality of the matching result, we chose a relatively strict caliper of $c = 0.1$ *SD* of the logit of the propensity score. After matching, we analyzed whether the covariates were actually balanced between the groups (balance property). For this purpose, we used the overall balance $\chi^2$ test (Hansen & Bowers, 2008) and the $L_1$ statistic (e.g., Iacus, King, & Porro, 2012). If good balance is achieved, $\chi^2$ should be nonsignificant, and $L_1$ should be smaller for the matched than for the unmatched samples (Iacus et al., 2012). In addition, we inspected univariate statistics for the covariates. Mean differences (expressed in Cohen's *d*) should be close to 0. Values of $d \geq 0.80$ were considered to indicate a large effect, $d \geq 0.50$ a moderate effect, and $d \geq 0.20$ a small effect (Cohen, 1988).

Furthermore, we investigated the overlap in the propensity score distributions of the two groups (area of common support). Small areas indicate that effect estimation is restricted to a very specific subsample. By contrast, large areas suggest that the results are representative of the full range of the sample at hand (Thoemmes & Kim, 2011).

#### 3.5.2. Group comparisons

Subsequently, we conducted group comparisons by computing multivariate analyses of variance (MANOVAs). When the results were statistically significant ($p < .05$), we computed univariate ANOVAs. To

control for α-error accumulation, we used the Bonferroni correction separately for the constructs under study and separately for self-assessments and parent assessments. As effect sizes, we used both $\eta^2$ and Cohen's *d*.

#### 3.5.3. Comparisons between students' self-perceptions and parents' assessments

We inspected the agreement (Pearson correlations) and the discrepancy (Cohen's *d*) between students' self-ratings and their parents' assessments made on the single items. We also examined whether agreement/discrepancy would be higher or lower in the gifted than in the non-gifted sample. To ensure comparability, we only used the data of those matched student dyads where both students had received a parent assessment. The rate of missing values was 1.65% for data provided by the students and 1.37% for data provided by the parents. We imputed the missing values by applying the expectation maximization algorithm implemented in SPSS.

## 4. Results

### 4.1. Propensity score matching

Univariate analyses of the mean differences in the covariates before matching revealed that there was only a (substantial) difference with regard to gender between the gifted and nongifted groups but no difference in the other covariates (see Table 1).

We nevertheless included the other covariates in the PSM to ensure that matching for gender did not result in increased mean differences in the other covariates. All 97 gifted students could be matched. The mean intelligence score (*z*-scaled) was SIS = 122 (*SD* = 2.72) for the intellectually gifted students and SIS = 103 (*SD* = 5.65) for the matched nongifted students. The overall balance test was not statistically significant, $\chi^2(3) = 0.67$, $p = .88$, indicating overall multivariate balance. As required, $L_1$ was smaller after matching ($L_1 = 0.38$) than before matching ($L_1 = 0.43$), documenting relative multivariate balance. Table 1 shows that parity in the gender distribution could be established while preserving equality in the other covariates. The area of common support was high (see Fig. 1). Thus, the matching procedure revealed good balance on age, gender, and SES and a high overlap between the gifted and nongifted groups so that (a) the two groups were comparable after matching and (b) the results were representative of a substantial array of our sample.

The intercorrelations of the dependent variables in the matched gifted and non-gifted samples can be found in Table S1 (students' self-reports) and Table S2 (parents' assessments) in the Supplementary materials.

**Table 1**
Means (M) and standard deviations (SD) of gifted and nongifted students on the covariates before and after 1:1 nearest neighbor matching without replacement (caliper = 0.1).

| | Gifted | | Nongifted | | *t* | *p* | *d* |
|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | | | |
| Before matching | | | | | | | |
| Age | 16.68 | 0.67 | 16.67 | 0.68 | 0.20 | .84 | 0.02 |
| Gender (0 = male, 1 = female) | 0.27 | 0.45 | 0.62 | 0.49 | −7.02 | < .001 | −0.72 |
| Socioeconomic status | 59.84 | 11.78 | 60.13 | 11.89 | −0.22 | .83 | −0.02 |
| After matching | | | | | | | |
| Age | 16.68 | 0.67 | 16.75 | 0.74 | −0.71 | .48 | −0.10 |
| Gender (0 = male, 1 = female) | 0.27 | 0.45 | 0.27 | 0.45 | 0.00 | > .99 | 0.00 |
| Socioeconomic status | 59.84 | 11.78 | 60.52 | 10.54 | −0.42 | .68 | −0.06 |

*Note.* Before matching: $n = 97$ (gifted group), $n = 529$ (nongifted group). After matching: $n = 97$ for both groups. Positive *t*- and *d*-values: greater values of the gifted students.

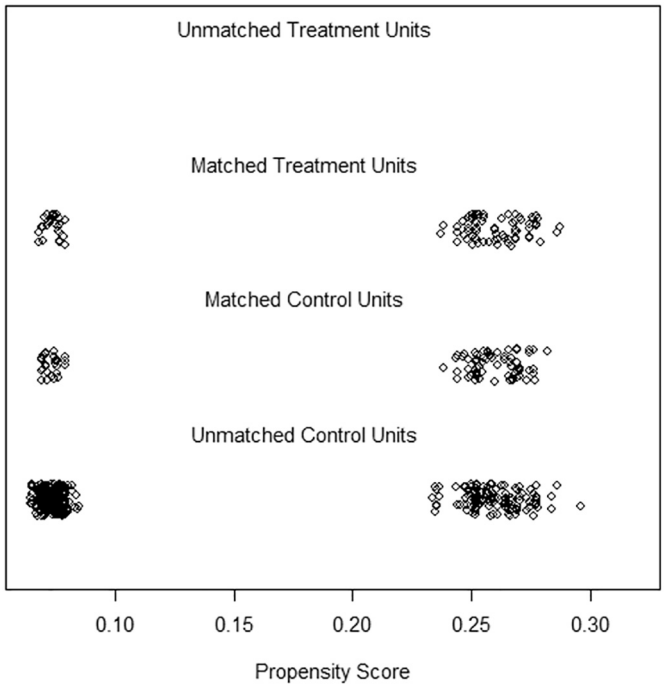


**Fig. 1.** Distributions of propensity scores for the unmatched and matched gifted ("treatment") and nongifted ("control") groups.

### 4.2. Group comparisons on self-perception data

#### 4.2.1. Personality

The MANOVA revealed a statistically significant effect of giftedness, $F(10, 183) = 2.34$, $p < .05$, $\eta^2 = 0.11$. Table 2 shows the means and standard deviations of the gifted and nongifted students' NEO-FFI scores and single-items as well as the ANOVA results. The gifted students scored significantly higher on Openness than the nongifted students ($d = 0.61$), supporting Hypothesis 1. This finding was not significant for the single item; however, the correlation of the single item with the Openness scale was low, see Section 3.2.1. We found no statistically significant differences regarding Neuroticism, rejecting Hypothesis 2. There were no significant differences in Extraversion, Conscientiousness, and Agreeableness.

#### 4.2.2. School performance

In line with Hypothesis 3, the gifted were significantly more successful in school than the nongifted, $F(6, 187) = 9.36$, $p < .001$, $\eta^2 = 0.23$. The gifted received better grades than the nongifted in all subjects, with *d*-values ranging from −0.63 to −1.02. Effect sizes were largest for mathematics, science, and GPA.

#### 4.2.3. Self-perceived intelligence

The multivariate comparison between gifted and nongifted adolescents was statistically significant, $F(15, 178) = 4.35$, $p < .001$, $\eta^2 = 0.27$. Specifically, the gifted reported higher self-perceived values for numerical intelligence ($d = 0.97$), figural intelligence ($d = 0.81$), and general reasoning ability ($d = 0.69$). They also reported higher verbal intelligence values, albeit this difference was relatively small ($d = 0.29$).[2]

[2] One could argue that the higher motivation of intellectually gifted students might solely be due to their higher academic achievement. Hence, we computed MANCOVAs and ANCOVAs for all motivational variables as well as academic

**Table 2**
Means (M), standard deviations (SD), and group differences between gifted and nongifted students in self-perceived personality, motivation, school grades, general knowledge, and intelligence.

| | Gifted | | Nongifted | | $F_{(1, 192)}$ | $p$ | $\eta^2$ | $d$ |
|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | | | | |
| Personality | | | | | | | | |
| Neuroticism | | | | | | | | |
| Scale | 2.66 | 0.62 | 2.72 | 0.63 | 0.51 | .48 | 0.003 | −0.11 |
| Single-item measure | 3.33 | 1.50 | 3.20 | 1.49 | 0.38 | .54 | 0.002 | 0.09 |
| Extraversion | | | | | | | | |
| Scale | 3.45 | 0.56 | 3.43 | 0.56 | 0.10 | .75 | 0.001 | 0.06 |
| Single-item measure | 4.72 | 1.33 | 4.75 | 1.43 | 0.02 | .88 | < 0.001 | −0.02 |
| Openness | | | | | | | | |
| Scale | 3.42 | 0.53 | 3.12 | 0.46 | 17.86 | < .001* | 0.085 | 0.61 |
| Single-item measure | 5.38 | 1.07 | 5.24 | 1.08 | 0.87 | .35 | 0.005 | 0.14 |
| Agreeableness | | | | | | | | |
| Scale | 3.35 | 0.52 | 3.45 | 0.47 | 2.04 | .16 | 0.010 | −0.20 |
| Single-item measure | 5.27 | 0.94 | 5.46 | 1.05 | 1.87 | .17 | 0.010 | −0.20 |
| Conscientiousness | | | | | | | | |
| Scale | 3.42 | 0.56 | 3.39 | 0.54 | 0.12 | .73 | 0.001 | 0.06 |
| Single-item measure | 4.99 | 1.19 | 5.11 | 1.19 | 0.53 | .47 | 0.003 | −0.11 |
| Motivation | | | | | | | | |
| Ability self-concepts | | | | | | | | |
| Math | | | | | | | | |
| Scale | 4.04 | 0.93 | 3.09 | 0.96 | 49.09 | < .001* | 0.204 | 1.01 |
| Single-item measure | 5.41 | 1.59 | 4.04 | 1.45 | 39.49 | < .001* | 0.171 | 0.91 |
| German | | | | | | | | |
| Scale | 3.33 | 0.84 | 3.58 | 0.69 | 5.08 | .03 | 0.026 | −0.33 |
| Single-item measure | 4.41 | 1.30 | 4.74 | 1.09 | 3.75 | .05 | 0.019 | −0.28 |
| Values | | | | | | | | |
| Overall (interest, importance, utility) | | | | | | | | |
| Math | 3.96 | 0.80 | 3.36 | 0.95 | 22.58 | < .001* | 0.105 | 0.69 |
| German | 3.25 | 0.92 | 3.52 | 0.80 | 4.76 | .03 | 0.024 | −0.31 |
| Interest | | | | | | | | |
| Math | 5.20 | 1.68 | 3.91 | 1.68 | 28.73 | < .001* | 0.130 | 0.77 |
| German | 4.21 | 1.56 | 4.24 | 1.53 | 0.01 | .92 | < 0.001 | −0.01 |
| Achievement motives | | | | | | | | |
| Hope for success | 2.95 | 0.53 | 2.67 | 0.56 | 12.74 | < .001* | 0.062 | 0.51 |
| Fear of failure | 1.42 | 0.42 | 1.70 | 0.59 | 14.45 | < .001* | 0.070 | −0.55 |
| Achievement motivation (single item) | 5.13 | 1.21 | 4.55 | 1.18 | 11.68 | .001* | 0.057 | 0.49 |
| Achievement goals | | | | | | | | |
| Learning goals | 3.99 | 0.54 | 3.86 | 0.54 | 2.86 | .09 | 0.015 | 0.25 |
| Performance-approach goals | 3.19 | 0.86 | 3.17 | 0.70 | 0.61 | .81 | < 0.001 | 0.04 |
| Performance-avoidance goals | 2.34 | 0.88 | 2.35 | 0.77 | 0.01 | .97 | < 0.001 | < −0.01 |
| Work avoidance | 2.59 | 0.87 | 2.51 | 0.82 | 0.48 | .49 | 0.002 | 0.09 |
| Grades | | | | | | | | |
| Math | 2.38 | 1.06 | 3.37 | 1.01 | 44.36 | < .001* | 0.188 | −0.96 |
| German | 2.73 | 0.78 | 3.25 | 0.71 | 22.87 | < .001* | 0.106 | −0.69 |
| Science | 2.41 | 0.91 | 3.18 | 0.70 | 43.08 | < .001* | 0.183 | −0.95 |
| Foreign languages | 2.79 | 0.72 | 3.25 | 0.73 | 19.09 | < .001* | 0.090 | −0.63 |
| Social sciences | 2.54 | 0.70 | 3.07 | 0.69 | 28.48 | < .001* | 0.129 | −0.77 |
| Grade point average | 2.54 | 0.64 | 3.16 | 0.57 | 49.84 | < .001* | 0.206 | −1.02 |
| General knowledge | | | | | | | | |
| Self-assessment | | | | | | | | |
| History | 4.04 | 1.30 | 4.23 | 1.43 | 0.90 | .34 | 0.005 | −0.14 |
| Math | 5.40 | 1.33 | 4.24 | 1.26 | 39.39 | < .001* | 0.170 | 0.91 |
| Geography | 4.40 | 1.28 | 4.47 | 1.28 | 0.15 | .70 | 0.001 | −0.06 |
| Economics | 3.63 | 1.23 | 3.84 | 1.09 | 1.61 | .21 | 0.008 | −0.18 |
| Arts | 3.50 | 1.12 | 3.59 | 1.28 | 0.23 | .63 | 0.001 | −0.06 |
| Daily life | 4.95 | 0.85 | 5.06 | 0.98 | 0.75 | .39 | 0.004 | −0.13 |
| Science | 5.12 | 1.26 | 4.41 | 1.09 | 17.71 | < .001* | 0.084 | 0.61 |
| Overall | 4.44 | 0.57 | 4.26 | 0.57 | 3.56 | .06 | 0.018 | 0.27 |
| Standardized overall test score | 104.92 | 5.95 | 99.42 | 4.27 | 54.56 | < .001* | 0.221 | 1.07 |
| Intelligence | | | | | | | | |
| Verbal intelligence | 5.10 | 1.04 | 4.82 | 0.90 | 3.99 | .047 | 0.020 | 0.29 |
| Numerical intelligence | 5.77 | 1.12 | 4.66 | 1.20 | 44.61 | < .001* | 0.189 | 0.97 |
| Figural intelligence | 5.39 | 1.02 | 4.53 | 1.12 | 31.84 | < .001* | 0.142 | 0.81 |
| Reasoning ability | 5.32 | 0.97 | 4.67 | 0.92 | 22.88 | < .001* | 0.106 | 0.69 |

*Note.* $N = 97$ for both groups. Positive *d*-values: greater values for the gifted students. Smaller values in grades indicate better performance. Cohen's *d*-values were calculated from $\eta^2$-values.

* Statistically significant after Bonferroni correction.

(*footnote continued*)
self-concept and the self-estimated abilities and held the academic achievement

(*footnote continued*)
(GPA) of the students constant. The results were comparable although smaller

#### 4.2.4. Self-perceived general knowledge

The MANOVA was statistically significant, $F(4, 189) = 13.75$, $p < .001$, $\eta^2 = 0.23$. Self-perceived knowledge was higher for the gifted in mathematics ($d = 0.91$), and in science ($d = 0.61$). For all other subscales, the gifted reported somewhat lower self-perceived knowledge than the nongifted, but these differences were small and not statistically significant. When the self-assessments for the knowledge domains were averaged, the gifted reported somewhat higher self-perceived general knowledge overall, but this difference was small and not significant. Thus, the gifted students rated their intellectual competencies higher than the nongifted students, supporting Hypothesis 5.

#### 4.2.5. Motivation

The MANOVA showed a statistically significant effect of giftedness, $F(15, 178) = 4.35$, $p < .001$, $\eta^2 = 0.27$. There were significant differences mostly in favor of the gifted on ability self-concepts, interests, values, and achievement motives. The gifted students reported a more positive mathematical ability self-concept ($d = 1.01$; single item: $d = 0.91$), greater interest in mathematics ($d = 0.77$), a higher valuing of mathematics ($d = 0.69$), a higher hope for success ($d = 0.51$), a lower fear of failure ($d = -0.55$), and a higher achievement motivation in general ($d = 0.49$). From a mere descriptive point of view, the nongifted reported a somewhat higher ability self-concept in German ($d = -0.33$; single item: $d = -0.28$), and valuing German ($d = -0.31$). However, these findings were not statistically significant after Bonferroni correction. There were also no significant differences in interest in German or in achievement goals. In sum, our hypotheses regarding academic self-concepts and school values were supported for mathematics, but not for German. Moreover, the gifted showed a higher achievement motivation, supporting Hypothesis 6. However, both groups did not differ regarding their achievement goals (Research question 1).

#### 4.2.6. General knowledge

The gifted achieved a markedly higher composite score than the nongifted, $F(1, 192) = 54.56$, $p < .001$, $d = 1.07$.

### 4.3. Group comparisons on parent assessments

Of the 97 gifted students, 72 (74.2%) had received a parent assessment. Gifted students with a parent assessment did not differ from gifted students without a parent assessment on any of the variables under study, except for grades: Gifted students with a parent assessment had a better GPA than gifted students without a parent assessment ($p < .001$; $d = 0.70$). From the matched nongifted students, 62 (63.9%) had received a parent assessment. This percentage was not significantly lower than for the gifted students, $\chi^2(1) = 2.41$, $p = .12$. The matched nongifted students with a parent assessment did not differ from those without a parent assessment on any of the variables under study, except from the grade in German ($p < .001$; $d = 0.80$).[3]

Before investigating mean differences in the parents' assessments, we checked for whether it mattered if the mother or father had made the assessment. There were no significant differences in any of the variables under study. The frequencies with which mothers or fathers had given the assessment did not differ between gifted and nongifted students either, $\chi^2(1) = 1.03$, $p = .31$.

Table 3 shows the means and standard deviations of the parent assessments for the gifted and nongifted students as well as the ANOVA results.

#### 4.3.1. Personality (parents' assessment)

The MANOVA revealed no statistically significant effect of giftedness, $F(5, 128) = 0.85$, $p = .52$, $\eta^2 = 0.03$. None of the differences regarding the personality variables were statistically or practically significant. Additionally, it has to be kept in mind that the correlations between the single item measures and the NEO scales for students were relatively low, especially for Openness to Experience (see Section 3.2.1). Therefore, the results from the single item parent reports on students' personalities have to be interpreted with caution.

#### 4.3.2. Motivation (parents' assessments)

A statistically significant multivariate effect of giftedness emerged, $F(5, 128) = 10.29$, $p < .001$, $\eta^2 = 0.29$. In accordance with the students' views of their scholastic abilities, the parents of the gifted students ascribed a markedly higher mathematical ability to their children than did the parents of the nongifted students ($d = 1.07$). The same was true for interest in mathematics ($d = 0.94$). There were no differences in parent-perceived ability or interest in German. Again, our hypotheses were supported for mathematics, but not for German.

#### 4.3.3. General knowledge (parents' assessments)

There was a statistically significant effect of giftedness, $F(7, 126) = 4.34$, $p < .001$, $\eta^2 = 0.19$. Like the students themselves, the parents of the gifted perceived their children to be more knowledgeable in mathematics ($d = 0.83$) and science ($d = 0.59$). The differences were negligible on all other scales. When averaged across all knowledge domains, the parents of the gifted ascribed to their children a somewhat higher general knowledge than the parents of the nongifted students did ($p = .04$, $d = 0.36$), which was however not significant after Bonferroni correction. Thus, Hypothesis 8 was only partly confirmed as we supposed higher scores on all knowledge domains.

#### 4.3.4. Intelligence (parents' assessments)

The MANOVA revealed a statistically significant effect of giftedness, $F(4, 129) = 9.01$, $p < .001$, $\eta^2 = 0.22$. In accordance with the students' views, in comparison with the parents of the nongifted students, the parents of the gifted students perceived their children as having higher verbal ($d = 0.42$), numerical ($d = 0.99$), and figural intelligence ($d = 0.51$) as well as general reasoning ability ($d = 0.81$).

### 4.4. Comparison between students' self-perceptions and parents' assessments

#### 4.4.1. Personality

As Table 4 shows, parent-student agreement for the Big Five was moderate, with correlations ranging from $r = 0.22$ ($p < .05$) for Agreeableness to $r = 0.43$ ($p < .001$) for Extraversion. Absolute differences (discrepancies) were small and not significant. Both agreement and discrepancy did not differ significantly for gifted and non-gifted students.

#### 4.4.2. Motivation

Agreement for motivation was higher than agreement for personality, especially when regarding ability ($r = 0.76$) and interest ($r = 0.77$) in mathematics (see also Table 4). It was somewhat lower, but still substantial, for ability ($r = 0.45$) and interest ($r = 0.65$) in German. For achievement motivation, $r = 0.36$. There were no significant differences in parent-student agreement between gifted and non-gifted students. With regard to discrepancy, parents rated their children as more able in mathematics and German than the students did themselves. Again, this finding held for both student groups.

(*footnote continued*)
in terms of the effect sizes.

[3] As there were comparatively less parent ratings for the non-gifted than for the gifted group, we additionally conducted a comparison only between the matched student dyads in which both students had received a parent assessment. The results are shown in Table S3 in the Supplementary materials. As can be seen, they did not differ substantially from the results with missing parents' assessments.

**Table 3**
Means (M), standard deviations (SD), and group differences between gifted and nongifted students in parent-rated personality, motivation, general knowledge, school grades, and intelligence.

| | Gifted | | Nongifted | | $F_{(1, 132)}$ | $p$ | $\eta^2$ | $d$ |
|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | | | | |
| Personality | | | | | | | | |
| Neuroticism | 3.24 | 1.35 | 3.39 | 1.22 | 0.45 | .51 | 0.003 | −0.11 |
| Extraversion | 4.86 | 1.41 | 5.01 | 1.16 | 0.44 | .51 | 0.003 | −0.11 |
| Openness | 5.44 | 1.11 | 5.28 | 1.02 | 0.75 | .39 | 0.006 | 0.16 |
| Agreeableness | 5.51 | 1.13 | 5.62 | 1.07 | 0.31 | .58 | 0.002 | −0.09 |
| Conscientiousness | 5.29 | 1.27 | 5.19 | 1.44 | 0.21 | .65 | 0.002 | 0.09 |
| Motivation | | | | | | | | |
| Ability concepts | | | | | | | | |
| Math | 5.93 | 1.10 | 4.64 | 1.32 | 38.17 | < .001* | 0.224 | 1.07 |
| German | 5.19 | 1.24 | 5.06 | 1.04 | 0.37 | .54 | 0.003 | 0.11 |
| Interest | | | | | | | | |
| Math | 5.81 | 1.18 | 4.57 | 1.46 | 29.31 | < .001* | 0.182 | 0.94 |
| German | 4.78 | 1.46 | 4.78 | 1.43 | < 0.01 | .99 | < 0.001 | < −0.01 |
| Achievement motivation | 5.24 | 1.17 | 4.94 | 1.25 | 1.95 | .17 | 0.015 | 0.25 |
| General knowledge | | | | | | | | |
| History | 4.72 | 1.17 | 4.61 | 1.27 | 0.27 | .61 | 0.002 | −0.09 |
| Math | 5.90 | 1.06 | 4.98 | 1.15 | 23.02 | < .001* | 0.148 | 0.83 |
| Geography | 4.88 | 0.98 | 4.74 | 1.17 | 0.51 | .48 | 0.004 | 0.13 |
| Economics | 4.14 | 1.07 | 4.19 | 1.08 | 0.86 | .77 | 0.001 | −0.06 |
| Arts | 4.36 | 1.17 | 4.18 | 1.18 | 0.78 | .38 | 0.006 | 0.16 |
| Daily life | 5.07 | 0.97 | 5.06 | 0.87 | < 0.01 | .98 | < 0.001 | < 0.01 |
| Science | 5.53 | 1.02 | 4.91 | 1.08 | 11.47 | .001* | 0.080 | 0.59 |
| Overall | 4.94 | 0.72 | 4.67 | 0.80 | 4.32 | .04 | 0.032 | 0.36 |
| Intelligence | | | | | | | | |
| Verbal intelligence | 5.83 | 0.95 | 5.45 | 0.88 | 5.75 | .018 | 0.042 | 0.42 |
| Numerical intelligence | 6.39 | 0.80 | 5.42 | 1.17 | 32.24 | < .001* | 0.196 | 0.99 |
| Figural intelligence | 5.86 | 0.97 | 5.31 | 1.22 | 8.57 | .004* | 0.061 | 0.51 |
| Reasoning ability | 6.01 | 0.78 | 5.29 | 1.01 | 21.77 | < .001* | 0.142 | 0.81 |

*Note*. $N = 72$ (gifted group), $N = 62$ (nongifted group). Positive *d*-values: greater values for the gifted students. Cohen's *d*-values were calculated from $\eta^2$-values.
* Statistically significant after Bonferroni correction.

#### 4.4.3. General knowledge

With regard to the perception of general knowledge, agreement was moderate to substantial, depending on the knowledge domain. Whereas it was modest for economics ($r = 0.24$) and daily life ($r = 0.25$), it was substantial for the other domains, with correlations ranging from $r = 0.45$ for geography to $r = 0.68$ for mathematics. For the overall score, $r = 0.41$. Again, there were no statistically significant differences in agreement between the gifted and the non-gifted group. The largest difference referred to economics, with $r = 0.42$ for the gifted and $r = 0.04$ for the non-gifted students. Interestingly, with the exception of the domain of daily life, parents rated their children's knowledge higher than the students did themselves. This discrepancy ranged from $d = -0.35$ for mathematics and geography to $d = -0.65$ for arts. For the overall score, $d = -0.63$. Again, this was true for both groups.

#### 4.4.4. Intelligence

The findings for perceived intelligence were comparable with those for perceived knowledge. Agreement was moderate to substantial, ranging from $r = 0.27$ for reasoning ability to $r = 0.58$ for numerical intelligence. Descriptively, there was a tendency that parent-student agreement was higher for the non-gifted students, but none of the differences were statistically significant. Like for knowledge and ability on mathematics and German, parents rated their children higher on their intelligence than the students did ($-0.47 \leq d \leq -0.80$). Again, this finding was irrespective of the ability group.

## 5. Discussion

Only a few studies have focused on multiple aspects of the lives of intellectually gifted adolescents simultaneously. Further, the use of highly preselected samples and a lack of a control group of nongifted individuals have led to heterogeneous results regarding intellectually gifted individuals and a somewhat problematic picture of the gifted in public (Baudson, 2016). For example, if gifted individuals from a counseling center or gifted individuals within a psychological therapy were examined it is well likely that these individuals might also display school-related or other behavioral problems. In this context, these problems are less likely due to the giftedness itself but rather to many other reasons. Hence, if differences between highly preselected gifted and nongifted individuals occur, one cannot know if they are due to giftedness or to selection effects.

In the current study, we aimed to take previous methodological shortcomings into account: The participants stemmed from regular German Gymnasiums and were not attending special gifted classes, nor were they clients from a counseling center. Furthermore, we used a comparison group of nongifted adolescents and ensured comparability between the groups by using propensity score matching. We tried to fill several research gaps and examined not only the personality of gifted and nongifted adolescents, but also focused on several motivational constructs besides school performance. Furthermore, we additionally asked the parents of gifted and nongifted adolescents to rate their children on the aforementioned variables.

### 5.1. Limitations

Our study has some limitations that might limit the interpretation of our results. We used the definition of intellectual giftedness as characterized by a high level of general intelligence *g*. Although this is a common practice in giftedness research (Warne, 2016), our results might have been different if we had used other indicators of intellectual giftedness such as performance or if we had applied multidimensional models of giftedness. Moreover, our results regarding personality and school functioning might have been different if we had focused on individuals with domain specific talents in mathematics or writing (see,

**Table 4**
Agreement and discrepancy between students' self-ratings and parents' assessments.

| | Overall | | Gifted students | | Nongifted students | | $z_r$ | $z_d$ |
|---|---|---|---|---|---|---|---|---|
| | *r* | *d* | *r* | *d* | *r* | *d* | | |
| Personality | | | | | | | | |
| Neuroticism | 0.35** | 0.11 | 0.44** | 0.18 | 0.27 | 0.04 | 0.88 | 0.32 |
| Extraversion | 0.43*** | −0.26 | 0.48** | −0.14 | 0.39** | −0.38 | 0.50 | −0.54 |
| Openness | 0.25* | −0.17 | 0.38** | −0.17 | 0.10 | −0.17 | 1.36 | 0.00 |
| Agreeableness | 0.22* | −0.11 | 0.17 | −0.25 | 0.27 | 0.03 | −0.48 | −0.63 |
| Conscientiousness | 0.28** | −0.17 | 0.22 | −0.39 | 0.35* | 0.03 | −0.64 | −0.95 |
| Motivation | | | | | | | | |
| Ability concepts | | | | | | | | |
| Math | 0.76*** | −0.31* | 0.67*** | −0.35 | 0.75*** | −0.33 | −0.73 | −0.04 |
| German | 0.45*** | −0.50*** | 0.48** | −0.60** | 0.43** | −0.38 | 0.29 | −0.48 |
| Interest | | | | | | | | |
| Math | 0.77*** | −0.28 | 0.72*** | −0.38 | 0.76*** | −0.23 | −0.40 | −0.82 |
| German | 0.65*** | −0.29 | 0.60*** | −0.20 | 0.71*** | −0.38 | −0.88 | 0.40 |
| Achievement motivation | 0.36** | −0.16 | 0.28 | −0.14 | 0.42** | −0.16 | −0.72 | 0.05 |
| General knowledge | | | | | | | | |
| History | 0.57*** | −0.52*** | 0.52*** | −0.57** | 0.62*** | −0.47* | −0.67 | −0.22 |
| Math | 0.68*** | −0.35* | 0.53*** | −0.38 | 0.72*** | −0.36 | −1.44 | −0.04 |
| Geography | 0.45*** | −0.35* | 0.42** | −0.53* | 0.49** | −0.17 | −0.40 | −0.80 |
| Economics | 0.24* | −0.40** | 0.42** | −0.50* | 0.04 | −0.31 | 1.85 | −0.42 |
| Arts | 0.47*** | −0.65*** | 0.49** | −0.71** | 0.47** | −0.59** | 0.12 | −0.26 |
| Daily life | 0.25* | −0.03 | 0.29 | −0.16 | 0.21 | 0.09 | 0.39 | −0.57 |
| Science | 0.56*** | −0.40** | 0.39** | −0.28 | 0.64*** | −0.56* | −1.57 | 0.62 |
| Overall | 0.41*** | −0.63*** | 0.27 | −0.76** | 0.50*** | −0.52* | −1.23 | −0.52 |
| Intelligence | | | | | | | | |
| Verbal intelligence | 0.37*** | −0.80*** | 0.25 | −0.76** | 0.52*** | −0.87*** | −1.45 | 0.23 |
| Numerical intelligence | 0.58*** | −0.65*** | 0.40** | −0.72** | 0.55*** | −0.70** | −0.88 | −0.04 |
| Figural intelligence | 0.40*** | −0.47** | 0.20 | −0.41 | 0.48** | −0.57** | −1.45 | 0.35 |
| Reasoning ability | 0.27** | −0.79*** | 0.08 | −0.95*** | 0.29 | −0.72** | −0.99 | −0.48 |

*Note.* $N = 44$ for both groups. Positive *d*-values: greater values for students than for parents.
* $p \leq .05$.
** $p \leq .01$.
*** $p \leq .001$.

for example, the results regarding the "Study of Mathematically Precocious Youth": Lubinski & Benbow, 2006; see also Olszewski-Kubilius et al., 2016). We recruited samples from only the highest track in the German school system, and thus, both samples were preselected and this might have influenced our results. However, the selection effect was not as strong as for samples from gifted classes or special gifted programs as the IQ values of the entire sample was $M = 111.8$ ($SD = 9.8$). The use of samples from a Gymnasium was necessary to create a sufficiently large gifted sample because gifted students are underrepresented at the other secondary school types. Gifted underachievers do not attend a Gymnasium as often as gifted achievers (Sparfeldt et al., 2006). Therefore, intellectually gifted underachievers may have been underrepresented in our sample. Studies have shown that gifted underachievers tend to have lower academic self-concepts, lower school achievement, and are seen as more problematic by their parents compared with other peers (Hanses & Rost, 1998). However, given the relatively small number of gifted underachievers (i.e., 12% of all gifted students in the Marburg Giftedness Project; Hanses & Rost, 1998), the likelihood that our results were distorted by an underrepresentation of gifted underachievers is rather low. However, future studies should use larger samples with students from other school types, including gifted underachievers, to replicate our results.

We used propensity score matching to create comparable groups of gifted and nongifted adolescents. Although this is one strength of our study, we could have used more covariates to create similar groups such as class or school membership. Moreover, additional variables not included in our analyses such as family structure or other school characteristics could have been used (Fan & Nowell, 2011). In this context, the consideration and selection of adequate covariates can also be seen as one important limitation of any matching procedure as one cannot be certain that all relevant variables are available.

Another limitation refers to the fact that we used only single items for the parents' assessments: Especially for the personality dimensions, the full scales and the single items showed only small associations with the self-perception data. Hence, the results concerning the personality ratings of parents have to be interpreted with caution.

We assessed academic self-concept as well as school values domain-specific for the school subjects German and mathematics. For these motivational constructs the domain-specificity is well documented in the literature (e.g., Arens, Yeung, Craven, & Hasselhorn, 2011; Steinmayr & Spinath, 2010). However, we did not assess achievement motives and achievement goals domain-specific although there is some evidence regarding their domain specificity (Sparfeldt, Buch, Wirthwein, & Rost, 2007; Sparfeldt & Rost, 2011). This missing domain-specificity might be one reason why we did not find differences between gifted and nongifted students regarding achievement goals and future studies should take this into account.

### 5.2. Self-perception data

#### 5.2.1. Personality

In line with previous studies (Limont et al., 2014; McCrae et al., 2002; Zeidner & Shani-Zinovich, 2011) we found that gifted adolescents scored higher on Openness to Experience. Hence, gifted adolescents describe themselves as being intellectually curious and interested in trying new things. Moreover, Openness to Experience refers to displaying unconventional beliefs. Gifted individuals seem to additionally have a higher need for cognition and are more interested in different ideas in general than nongifted individuals (Meier, Vogl, & Preckel, 2014). However, one has to keep in mind that the difference between the groups was medium-sized in terms of practical significance ($d = 0.61$). Contrary to the studies by Limont et al. (2014) and Zeidner

and Shani-Zinovich (2011), and unexpectedly, gifted adolescents did not have significantly lower scores on neuroticism ($d = -0.11$). Correlational studies have found associations between conscientiousness and intelligence (e.g., Ackerman & Heggestad, 1997) but research has failed to find higher conscientiousness in gifted individuals compared to nongifted individuals. This was also true for our investigation. In this context, it can be speculated that intellectually gifted students do not necessarily have to be dutiful or organized (core characteristics of Conscientiousness) to perform well on academic tasks because of their high intellectual potential. In sum, our results underpin the fact that intellectually gifted adolescents describe their personality as very similar to nongifted adolescents (with the exception of Openness to Experience).

#### 5.2.2. School adjustment and motivation

In line with previous studies (Roznowski et al., 2000), gifted adolescents had higher school grades and higher GPAs compared with nongifted adolescents. The largest differences emerged for grades in mathematics ($d = -0.96$) and GPA ($d = -1.02$). These results seem plausible given that grades in mathematics as well as GPA have the highest associations with intelligence (Roth et al., 2015).

Intellectually gifted adolescents displayed higher scores than nongifted adolescents on the vast majority of the investigated motivational constructs, supporting the results from Litster and Roberts (2011), Preckel et al. (2008), and Zeidner and Shani-Zinovich (2015). Gifted adolescents had higher academic self-concepts in mathematics, valued mathematics more, and were more interested in mathematics ($d = 0.77$ to $d = 1.01$). These results were also confirmed when we controlled for the better achievement of intellectually gifted adolescents: Even when intellectually gifted and nongifted adolescents had comparable grades, the gifted students showed significantly higher motivation in mathematics. Moreover, it might be that gifted individuals willingly deal with cognitively challenging tasks and are also more successful, resulting in a higher academic self-concept but also in a higher intrinsic motivation (Gottfried & Gottfried, 1996). However, although gifted adolescents also displayed higher grades in German, the differences for academic self-concepts and interest in German were comparatively small. The gifted adolescents even valued German somewhat less ($d = -0.31$). In the Marburg Giftedness Project, the differences between gifted and nongifted adolescents were also higher for academic self-concept in mathematics than in German (see Wirthwein et al., 2011). Perhaps this could be due to the different cognitive challenges of the school subjects mathematics and German. Moreover, mathematics achievement is more strongly linked with intelligence than is achievement in German (Leeson et al., 2008; Roth et al., 2015) and mathematics is perceived by students as an important indicator of cognitive ability (Hannover & Kessels, 2004).

With regard to the domain-general motivational constructs, we found group differences only for achievement motives. Gifted adolescents expressed a higher hope for success ($d = 0.51$) and a lower fear of failure ($d = -0.55$). This, again, might be due to the higher school success of the gifted. Previous results focusing on achievement goals have been mixed (Marzooghi et al., 2009; Ziegler et al., 1996). We found no statistically significant differences regarding achievement goals, thus revealing that the intentions with which students engage in achievement behavior do not systematically differ between gifted and nongifted adolescents. To sum up, with the exception of the value assigned to German, gifted adolescents showed high motivation for school and were confident in their scholastic abilities, especially in mathematics.

Another research question focused on students' self-perceived competence in different facets of intelligence. The results for self-rated intellectual abilities were consistent with the results we found for the other motivational variables: Gifted adolescents rated their numerical ($d = 0.97$) but also their figural ($d = 0.81$) and reasoning abilities ($d = 0.69$) significantly higher than nongifted adolescents. The fact that intellectually gifted students also estimated their knowledge in mathematics and science higher than nongifted students showed their fair and realistic judgments: The gifted scored 1 *SD* ($d = 1.07$) better on the standardized general knowledge test compared with the nongifted. These results imply that intellectually gifted students are aware of their high intellectual potential. Hence, the gifted seem to have optimal requirements for performing well in school (Steinmayr & Spinath, 2009a).

### 5.3. Data from parents

There are different checklists based on alleged characteristics of gifted children (e.g., Silverman et al., 1986). Corresponding studies usually ask parents to rate a child who has already been diagnosed as intellectually gifted. Hence, these results cannot be interpreted adequately because different stereotypes about the gifted might lead to misleading results. As already mentioned, studies on parents' assessments of a gifted child—without knowing that the child is actually gifted—are lacking, and the current study was aimed at closing this research gap. Regarding personality, we found no statistically significant differences that indicated that parents of gifted adolescents view their child as different compared with parents of nongifted adolescents. One has to keep in mind that the children's personality was assessed with only one item. However, we found differences in school adjustment and motivation, and these results were comparable to the results found for the self-perception data. The parents of gifted adolescents rated their children's ability self-concept as well as interest in math significantly higher ($d = 1.07$ and $d = 0.94$) than parents of nongifted adolescents. Moreover, knowledge in math ($d = 0.83$) and science ($d = 0.59$) were rated higher for gifted adolescents. The intelligence of gifted adolescents was also evaluated as higher than the intelligence of nongifted adolescents ($d = 0.42$ for verbal intelligence, $d = 0.99$ for numerical intelligence, $d = 0.51$ for figural intelligence, and $d = 0.81$ for general reasoning ability; actual differences between the test scores of gifted and nongifted individuals: $M_{IQ} = 103.2$ vs. 121.1, $SD = 11.99$ vs. 7.00, $d = 1.83$ for verbal intelligence; $M_{IQ} = 106.6$ vs. 129.6, $SD = 11.50$ vs. 8.35, $d = 2.30$ for numerical intelligence; $M_{IQ} = 99.9$ vs. 123.5, $SD = 10.77$ vs. 9.77, $d = 2.30$ for figural intelligence; and $M_{IQ} = 104.7$ vs. 133.8, $SD = 8.48$ vs. 4.09, $d = 4.40$ for general reasoning ability). These results point to the fact that gifted adolescents are not seen as more problematic than adolescents with average intelligence with regard to their school functioning or their personality and again support the harmony hypothesis. However, gifted individuals are still seen as more problematic by the public (e.g., Baudson, 2016), and future research should focus on the reasons underlying the negative stereotypes of the gifted.

Regarding the comparison between students' self-perceptions and parents' assessments, both agreement and discrepancy were not significantly different for gifted and non-gifted adolescents. Hence, parents of gifted adolescents did not rate their child more or less accurate than parents of non-gifted adolescents. However, the parent-student agreements considerably varied by construct. The agreement regarding motivation, intelligence, and knowledge was higher than the agreement regarding personality. In sum, parents rated their children higher on their intelligence, knowledge, and ability self-concepts than the students did. These effects confirm the results of other studies indicating that parents usually overestimate the intelligence of their children (Furnham, 2001).

Taken together, our study offers a comprehensive overview of the personality, motivation, and educational attainment of gifted students by considering both self-reports and parents' assessments and by using a methodologically sound approach to create a matched control group for the gifted sample. In sum, our results do not support the hypothesis that giftedness is a risk factor for the development of school problems or for differences in personality.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.lindif.2019.04.003.

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