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The Big Five Personality Traits and School Achievements of Children: The Role of Gender

Cechy osobowości a osiągnięcia szkolne uczniów. Znaczenie płci kulturowej

Abstract. The goal of the current study was to explore the relations between the Big Five personality traits and school achievements of children in the fourth grade of primary school. Participants were ($n = 157$) children (aged 9–11 years) attending public primary school in Poland. Children completed a self-description inventory for the Big Five and teachers evaluated current school achievements of children for mathematics and Polish language. The obtained results indicated that neuroticism and openness to experiences were significantly associated with school achievements. Moreover, the relationship between the Big Five and school achievements was moderated by gender in that a) agreeableness as well as the Big Five sub-scales of inferiority and helping behaviour were negatively associated with school achievements only among girls, and b) the openness to experience sub-scale of problem solver was positively associated with school achievements only among boys. The results suggest that the relationship between the Big Five personality traits and school achievements may depend on gender.

Keywords: school achievement, the Big Five, gender differences, school adjustment, school-age

Słowa kluczowe: osiągnięcia szkolne, Wielka Piątka, różnice płci kulturowej, przystosowanie szkolne

Personality structure studies have identified five independent personality factors – neuroticism, extraversion, openness to experience, agreeableness and conscientiousness, known as the Big Five (e.g., McCrae, Costa, 1987; Zuckerman et al., 1993). Research results of school-age children and adolescents indicate that the five-factor model of personality can predict school achievement (Bakar, Herg, 2018). Conscientiousness, openness to experience and agreeableness are most often associated with school achievements (Komarraju et al., 2011; Meyer

et al., 2019). Moreover, some research results indicate a relationship between extraversion and neuroticism and school achievement (Bakar, Herg, 2018; Laidra et al., 2007). Due to the fact that the results of the studies differ and different personality traits according to the Big Five are found to be related to school achievement, the researchers highlighted the role of mediators and moderators in the relationship between the Big Five and school achievements – for example, such a mediator can be motivation, self-control or dealing with negative

affect (Feyter et al., 2012; Kyllonen et al., 2014). Moreover, the relationship between the Big Five and school achievements may also depend on gender (Freudenthaler et al., 2008; Hicks et al., 2008). Therefore, in the current study, it was decided to examine the relationship between the Big Five personality traits and the school achievements of children in the fourth grade of primary school, which is a fairly new area because the current research mostly focuses on adolescents and students. In addition, the current study assumed that gender can be a moderator of the relationship between the Big Five and school achievements. These results will not only broaden existing knowledge about how personality traits according to the Big Five model explain school achievements in elementary school, but will also contribute to better understanding and explaining differences in school achievements between girls and boys. Research results to date indicate that girls have higher school achievements than boys (e.g., Freudenthaler et al., 2008; Israel et al., 2019; Sorić et al., 2017).

Among the various personality theories, a five-factor personality model can be distinguished. This model has been confirmed in many studies of adults (e.g., Fiske, 1949; Norman, 1963; Tupes, Christal, 1992), and in studies involving free descriptions of children's characteristics by teachers and parents (Halverson et al., 2003; Measelle et al., 2005). Additionally, self-description studies of children have also confirmed this model (Cieciuch et al., 2016; Oleś, 2010; Zupančič, 2008).

School-age children demonstrate the capacity for self-reflection and rely on reasoning when making judgments. They possess the ability to observe their own thoughts, emotions, and actions. They are capable of setting long-term goals and planning tasks. Furthermore, they display interest in various subjects and can identify their strengths and weaknesses. They actively monitor their actions, such as striving for higher academic achievements or preparing for tests. During the school period, their self-image becomes more deeply rooted in enduring internal values and becomes less influenced by situational factors compared to earlier developmental stages (Brzezińska in.,

2015). Consequently, measurements based on self-reports from school-aged children exhibit satisfactory psychometric properties, signifying their reliability and validity. Moreover, the results obtained through these assessment tools align with the descriptions of children provided by their guardians, including parents and teachers (Cieciuch et al., 2016).

The five personality factors are: neuroticism – reacting with anxiety in stressful situations, emotional sensitivity, worry; extroversion – time spent with others, life activity, optimism; agreeableness – empathy, cooperation, pro-social; openness to experience – curiosity about the world, creativity, unconventional behaviour; conscientiousness – pursuing a goal, accuracy and organization (Costa, McCrae, 1992; O'Connor, Paunonen, 2007; Oleś, 2010). The study of personality traits according to the Big Five model in the school context has directed attention to the relationship between personality traits and school adjustment of children, e.g. neuroticism is associated with children's internalization problems (Smith et al., 2017) and agreeableness is related to students' social competences (Jensen-Campbell et al., 2002). In addition, some studies explain the school achievements using the Big Five (Hakimi et al., 2011; Komaraju et al., 2011; Meyer et al., 2019), which in turn are related to school adjustment (Lakhani et al., 2017).

The results of studies on the Big Five personality model in the school context indicate that children's school achievements are associated with all five personality factors. Neuroticism is negatively linked to school achievement (Chamorro-Premuzic, Furnham, 2003), although sometimes it can motivate and be positively related to school achievement (Komaraju et al., 2011). The relationship between extraversion and school achievements looks similar. Some research results indicate, on the one hand, that extraversion is positively linked to school achievement (Meyer et al., 2019), because it can increase, for instance, activity in lessons and this is positively associated with school achievements and, on the other hand, extraversion is negatively related to school achievements because extroverted children are more

impulsive, motivated externally and this in turn is negatively associated with school achievements (Hakimi et al., 2011). Conscientiousness and openness to experience positively predict school achievements (Meyer et al., 2019), but this relationship can change if achievements are assessed, e.g. in mathematics or English. School achievements in mathematics depend more on conscientiousness and in English on openness to experience (Lipnevich et al., 2016). In addition, the relationship between achievements in mathematics and openness to experience can be negative. As Meyer and colleagues (2019) explain, this probably comes from the fact that students with higher openness to experience are associated with a more creative, unconventional way of thinking and this is more helpful to language rather than mathematical achievements that require a more analytical way of thinking. Agreeableness is positively associated with school achievement (Hakimi et al., 2011; Komarraju et al., 2011; Meyer et al., 2019). Agreeable children are characterized by the ability to cooperate with other children, and this helps in obtaining higher school achievement.

Mediators and moderators can play an important role in the relationship between the Big Five personality traits and school achievements, e.g. this relationship may depend on the age of the students (Poropat, 2009; Spengler et al., 2016) and how to operationalize school achievements, e.g. report card grades, standardized tests or final exams (Meyer et al., 2019). An important mediator of the relationship between conscientiousness and school achievement is the goal orientation of students (Sorić et al., 2017). Conscientious students are more goal-oriented, which is why this approach to learning is more efficient and contributes to higher school achievement. Moreover, conscientiousness is indicated by some researchers as the most important and frequent predictor of school achievements among personality traits according to the Big Five (Poropat, 2009; Spengler et al., 2016). Malykh (2017) in a study of adolescents observed that students' school achievements were predicted directly by conscientiousness, and openness to experience and extraversion predicted school achievements indirectly through

fluid intelligence. In addition to the mediators and moderators of the relationship between the Big Five and school achievements, gender can play an important role. Research results indicate that girls have higher school achievements than boys (Freudenthaler et al., 2008; Israel et al., 2019; Sorić et al., 2017). As some researchers explain, this may be due to differences in social skills or different socialization processes (Carvalho, 2016). Boys more often than girls exhibit externalizing behaviours, e.g. aggression, which in turn is negatively associated with school achievements (Hicks et al., 2008), and girls are more likely to engage in mutual cooperation, are more empathic or behave in a more agreeable way (Freudenthaler et al., 2008). In addition, differences in school achievement can be the result of better developed verbal competences in girls compared to boys (Halpern, 2000; Hyde, 2016).

Summing up, the aim of the current study was to explain school achievements of school-age children by personality traits according to the Big Five. In line with this aim, the following hypotheses were formulated:

Hypothesis 1: A positive correlation was expected between conscientiousness, openness to experience, agreeableness, and school achievement;

According to previous research, the personality traits encompassed by the Big Five model have been found to be associated with children's school achievement. Specifically, conscientiousness, openness to experience, and agreeableness have shown a positive correlation with school achievement (Hakimi et al., 2011; Komarraju et al., 2011; Meyer et al., 2019). Conscientious children exhibit traits such as self-discipline, perseverance, and goal-directed behavior. These characteristics are linked to improved academic performance, as they enable children to invest greater effort in school-related tasks, thereby increasing the likelihood of higher school achievement. Openness to experience reflects a receptiveness to new ideas and cognitive curiosity. Students with high levels of openness are more inclined to actively engage in learning, displaying a greater willingness to

acquire new knowledge and a heightened curiosity for the subject matter. These attributes contribute to enhanced school achievement. Similarly, agreeableness is associated with interpersonal qualities, including a cooperative attitude towards peers and teachers, empathy, and pro-social behavior. Students exhibiting high levels of agreeableness tend to cultivate positive relationships with both their educators and fellow students, resulting in more effective learning processes and elevated levels of school achievement (Meyer et al., 2019; Zhou, 2015).

Hypothesis 2: It was anticipated that school achievements in the fourth grade of primary school would be explained to the greatest extent by conscientiousness;

Among the traits of the Big Five model, conscientiousness is consistently identified as the personality trait most strongly associated with children's school achievement. This relationship has been confirmed by various studies conducted at different levels of education. Conscientious students typically exhibit characteristics such as self-discipline, goal-directed behavior, and ambition, which are critical to academic success (Costa, McCrae, 1992; O'Connor, Paunonen, 2007; Oleś, 2010). Compared to other traits within the Big Five, conscientiousness includes a set of personality elements that are particularly relevant to school achievement (Poropat, 2009; Spengler et al., 2016). Moreover, starting from the fourth grade onwards, students are exposed to more complex lessons and assignments compared to earlier grades. As a result, students are required to demonstrate better organizational skills and a greater sense of responsibility. In this context, children with a higher level of conscientiousness are likely to find it easier to cope with the demands of normal school settings. Their self-discipline and goal-oriented behavior harmonize well with the increased expectations and responsibilities encountered at this stage, leading to greater success in their academic pursuits (Zhou, 2015).

Hypothesis 3: School achievements in mathematics will be explained to the highest degree by conscientiousness, and school achievements in Polish will be explained to the highest degree by openness to experience.

Individual personality traits, as defined by the Big Five model, may exhibit different associations with school achievement depending on the specific subject area. Research findings suggest that school achievement in mathematics is primarily associated with conscientiousness, while achievement in language subjects is linked to openness to experience (Israel et al., 2019; Meyer et al., 2019). Success in mathematics often relies on problem-solving skills, logical thinking, and a systematic approach, which align, to some extent, with the conscientiousness trait. Conscientious students who demonstrate diligence in their work, focus on task details, and possess attributes conducive to success in learning mathematics are more likely to achieve higher levels of academic accomplishment (Costa, McCrae, 1992; O'Connor, Paunonen, 2007; Oleś, 2010). On the other hand, in language subjects such as learning Polish, features like cognitive curiosity, openness to new ideas, understanding of textual material, and expressive knowledge become particularly important. These attributes correspond more closely to the openness to experience trait (Komarraju et al., 2011; Meyer et al., 2019). As a consequence, students with a high level of openness to experience are more likely to attain higher levels of school achievement in learning Polish.

Hypothesis 4: It was assumed that gender would act as a moderator of the relationship between personality traits and school achievements.

The results of research indicate that there are indeed differences in school achievement between girls and boys (Steinmayr, Spinath, 2008). Girls tend to exhibit higher school achievements than boys. These differences can be attributed to a combination of biological and socio-cultural factors (Freudenthaler et al., 2008; Golsteyn, Schils, 2014; Steinmayr, Spinath, 2008). For instance: girls often demonstrate higher levels of agreeableness and neuroticism compared to boys (Steinmayr, Spinath, 2008); girls show more interest in language subjects, while boys tend to be more inclined towards exact subjects like mathematics (Steinmayr, Spinath, 2008); girls may prefer collaborative approaches, valuing teamwork and cooperation, while boys may lean

towards independent problem-solving strategies, emphasizing individual autonomy (Carvalho, 2016; Freudenthaler et al., 2008; Hicks et al., 2008); girls tend to demonstrate more effective learning strategies, displaying higher levels of seriousness, diligence, and studiousness, while boys may exhibit more disruptive behavior, lower self-discipline, and anti-school attitudes (Bertocchi, Bozzano, 2020; Golsteyn, Schils, 2014). These differences in personality traits and preferences may contribute to variations in school performance between boys and girls.

METHOD

Participants and procedure

The participants of the current study were 157 children, 68 boys and 89 girls, selected from public primary schools in Wrocław, Poland. The age of the respondents was in the range of 9–11 ($M = 10.3$; $SD = .56$). The study was approved by school heads, teachers and parents. Prior to the study, consent was obtained from the children and information was provided regarding the purpose of the study and its confidentiality. During the preparation and conduct of the study, all the principles of the Code of Ethics of the Polish Psychological Association have been respected. Teachers were asked to complete a tool to measure children's school achievements.

Measures

School achievements of children were evaluated by their teachers using a 5-point scale from 1 (*very bad*) to 5 (*very good*). Teachers evaluated current school achievements in two main subjects, i.e. mathematics and Polish. The current study did not use standardized tests to measure school achievements, because the results of earlier studies indicate that self-reported grades can be considered as reliable and valid indicators of achievement (Caprara et al., 2011; Coplan et al., 2017; Israel et al., 2019). School achievement in Polish and mathematics were positively correlated ($r = .71$, $p < .001$). To

achieve the research purpose, a general indicator of school achievements was also created by the sum of the previous two.

The Big Five Personality Inventory for Children (Little, Wanner, 1998) is a 45-item self-description inventory in the Polish adaptation (Oleś, 2010). Each of the scales consists of 9 items that measure personality traits according to the Big Five: neuroticism (*I often feel unhappy*), extraversion (*I prefer to be with others than to be alone*), openness to experience (*I often wonder how things work*), agreeableness (*When someone succeeds in doing something I am happy for him or her*), conscientiousness (*I can do one thing for a long time*). The B5P-C's scales consist of three subscales, each with three items. The subscales are: neuroticism (general nervousness, inferiority, social worries), extraversion (extraverted, introverted, adventurous), openness to experience (problem solver, curiousness, sensitivity), agreeableness (empathy-sympathy, helping behaviours, prosociality) and conscientiousness (determined, hard-working, orderly). Study participants respond using a 4-point scale (*definitely untrue*, *untrue*, *true*, *definitely true*) and assess how much each phrase relates to them. The results in the study may vary for each of the scales between 9 and 36 points and the subscales between 3 and 12. In the study, internal consistency (Cronbach's alpha) of individual scales was: neuroticism $\alpha = .75$, extraversion $\alpha = .77$, agreeableness $\alpha = .87$, openness to experience $\alpha = .77$ and conscientiousness $\alpha = .62$.

Results

Descriptive statistics and correlations for all the variables included in the current study are presented in Table 1. The relationships between the studied variables were in the expected direction. Neuroticism was negatively associated and openness to experience was positively associated with general school achievement. Then, gender differences were explored. It turned out that girls were statistically significantly different from boys on Polish school achievements, general school achievement, extraversion, openness to experience and agreeableness. The results are presented in Table 2.

Table 1. Descriptive statistics and correlations for Study Variables

Variable	1	2	3	4	5	6	7	8
1. Polish school achievement	–	.71***	.93***	–.19*	.08	.22**	.09	.05
2. Mathematics school achievement		–	.92**	–.17*	–.02	.23**	.00	.05
3. General school achievement			–	–.20*	.04	.24**	.05	.05
4. Neuroticism				–	.10	.12	.21*	.18*
5. Extroversion					–	.40***	.51***	.48***
6. Openness						–	.52***	.65***
7. Agreeableness							–	.70***
8. Conscientiousness								–
<i>M</i>	3.77	3.84	7.61	22.23	29.10	28.10	30.05	26.75
<i>SD</i>	1.02	.93	1.80	4.83	4.62	4.70	4.60	3.93

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2. Gender differences for Study Variables

	Female (<i>N</i> = 89)		Male (<i>N</i> = 68)		<i>t</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Polish school achievement	4.08	.90	3.37	1.04	4.61***	.73
Mathematics school achievement	3.97	.87	3.68	.98	1.92	.31
General school achievement	8.04	1.63	7.04	1.86	3.58***	.57
Neuroticism	22.00	4.57	22.53	5.18	–.68	–.11
Extroversion	29.87	4.28	28.10	4.88	2.41*	.39
Openness	29.01	4.00	26.91	5.28	2.84**	.45
Agreeableness	31.38	3.43	28.31	5.32	4.15	.69
Conscientiousness	27.21	3.43	26.15	4.46	1.70	.27

*** $p < .001$; ** $p < .01$; * $p < .05$.

Table 3. Regression of school achievement on personality traits

Model	Polish school achievement				Mathematics school achievement				General school achievement			
	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>B</i>	<i>SE</i>	β	<i>t</i>
Neuroticism	-.05	.02	-.22**	-2.75	-.04	.02	-.18*	-2.30	-.08	.03	-.22**	-2.76
Extroversion	.01	.02	.02	.27	-.02	.02	-.09	-.94	-.01	.04	-.03	-.34
Openness	.07	.02	.31**	3.03	.07	.02	.37***	3.58	.14	.04	.36***	3.58
Agreeableness	.02	.03	.11	.94	-.01	.02	-.07	-.58	.01	.04	.03	.24
Conscientiousness	-.05	.03	-.20	-1.64	-.02	.03	-.07	-.55	-.07	.06	-.15	-1.22

* $p < .05$. ** $p < .01$. *** $p < .001$.

A regression analysis was carried out to see which personality traits most explained the general school achievements and in Polish and mathematics separately. The results are presented in Table 3. The obtained results indicated that neuroticism and openness to experience explained general school achievements (12% explained variance), Polish (11% explained variance) and mathematics (11% explained variance). Since no significant differences were observed between school achievements, only the general school achievement was tested in the rest of the analysis.

In the next steps of the analysis, the role of the moderator – gender, was examined for the relationship between the Big Five personality traits and school achievements. For this purpose, SPSS macro PROCESS (Hayes, 2019) was used to assess the moderator's effect on the path from personality traits to school achievements. A bootstrapping analysis was conducted using 5,000 bootstrap samples to estimate the 95% CI. The pathway between agreeableness and academic achievement was significantly moderated by gender ($B = .14$, $SE = .07$, $t = 2.05$, 95% CI = [.01, .28]). The effect from agreeableness to academic achievement was significant for girls ($B = -.11$, $SE = .05$, 95% CI = [-.22, .01]), and not significant for boys ($B = .03$, $SE = .04$, 95% CI = [-.05, .11]). Gender was an insignificant moderator ($p > .05$) for relations from neuroticism, extraversion, openness to experience and conscientiousness to school achievements.

In order to further explore the role of the moderator gender on the relationship between personality traits and school achievements, post hoc analyses were conducted. It was decided to examine whether gender can act as a moderator between the Big Five subscales and school achievements. It was revealed that a) The pathway between inferiority (neuroticism subscale) and school achievement was significantly moderated by gender ($B = .23$, $SE = .11$, $t = 2.04$, 95% CI = [.01, .46]). The effect from inferiority to school achievement was significant for girls ($B = -.27$, $SE = .07$, 95% CI = [-.42, -.12]), but it was not significant for boys ($B = -.04$, $SE = .09$, 95% CI = [-.21, .13]) b) The pathway between problem solver (openness to experience subscale) and school achievement was significantly moderated by gender ($B = .30$, $SE = .14$, $t = 2.04$, 95% CI = [.01, .58]). The effect from problem solver to academic achievement was significant for boys ($B = .30$, $SE = .10$, 95% CI = [.10, .49]), but it was not significant for girls ($B = .001$, $SE = .10$, 95% CI = [-.21, .21]) c) The pathway between helping behaviour (agreeableness subscale) and school achievement was significantly moderated by gender ($B = .39$, $SE = .17$, $t = 2.33$, 95% CI = [.06, .73]). The effect from helping behaviour to academic achievement was significant for girls ($B = -.33$, $SE = .13$, 95% CI = [-.59, -.07]), but it was not significant for boys ($B = .06$, $SE = .11$, 95% CI = [-.15, .27]). In the remaining relationship between the Big Five subscales and school achievements, gender was insignificant ($p > .05$).

DISCUSSION

The aim of the study was an attempt to explain school achievements among school-age children using personality traits according to the Big Five model. In addition, it was assumed that gender would act as a moderator of the relationship between the Big Five and school achievements. The results from the correlation analysis indicated that school achievements are negatively linked to neuroticism and positively to openness to experience (Hypothesis 1 was only partially confirmed). The type of school achievements, i.e. mathematics or Polish, was irrelevant. The obtained results are consistent with previous studies that confirm the negative relationship of neuroticism (Chamorro-Premuzic, Furnham, 2003) and the positive relationship of openness to experience (Lipnevich et al., 2016) with school achievements. On the contrary, no significant relationship between conscientiousness, agreeableness and school achievement was observed in the study, which has been observed in adolescents in previous studies (Sorić et al., 2017; Malykh, 2017). Summing up the results of the correlation analysis, it can be seen that in school-age children school achievements are probably differently associated with the Big Five than the school achievements of adolescents. Specifically, school achievements of school-age children depend on emotional balance and general curiosity about the world, and school achievements of adolescents depend more on the ability to pursue a goal or organize their work. Moreover, elementary school children are generally required to have more general knowledge than adolescents in high school, which may contribute to the fact that different personality traits will play a different role in explaining school achievements depending on the educational stage. For instance, children in primary school are in the midst of intensive development, emphasizing exploration and curiosity. They focus on acquiring a broad knowledge base across various subjects. In contrast, adolescents start to specialize in specific subjects, engage in more advanced activities, and need to effectively manage their workload (Laidra et al., 2007).

Regression analysis results revealed that each of the school achievements studied was predicted by neuroticism and openness to experience. This result is consistent with research emphasizing the important role of openness to experience in explaining school achievements (Bratko et al., 2006; Laidra et al., 2007; Meyer et al., 2019), particularly in primary school (Laidra et al., 2007; Zhou, 2015). However, no differences in explaining school achievements between mathematics and Polish were observed, and conscientiousness did not explain school achievements as previously assumed (Hypothesis 2 and 3 were not confirmed). According to the model explaining school achievements, openness to experience and lack of conscientiousness may support the hypothesis that intellect plays an important role in explaining school achievements in earlier school grades – sometimes associated with intelligence tests (Freudenthaler et al., 2008; Malykh, 2017) and in later grades the role of intellect decreases in favour of other personality traits such as conscientiousness (Laidra et al., 2007; Smidt, 2015). From the results obtained, it can be assumed that children in primary school with higher school achievements, on the one hand, are characterized by general curiosity, sensitivity to the surrounding world, willingness to solve new problems and openness to intellectual tasks and, on the other hand, a certain emotional stability consisting, among others, in coping skills for new and stressful situations (Chamorro-Premuzic, Furnham, 2003; Laidra et al., 2007; O'Connor, Paunonen, 2007). Furthermore, based on the results, it appears that mathematical and language skills in the fourth grade of primary school are of such a general nature that different personality traits according to the Big Five model, explain performance in these two subjects in a similar manner. Perhaps there are other distinctive features that can better explain school achievement in language and science subjects, e.g. verbal competences for language subjects and perceptual-motor skills for science subjects (Peterson et al., 2017; Rabiner et al., 2016).

The current study revealed some significant differences in explaining school achievements

based on gender (Hypothesis 4 was confirmed). It turned out that gender is a moderator between agreeableness and school achievement. Agreeableness was significantly negatively linked to school achievement in girls and insignificantly related in boys. Such a result is surprising, because in previous studies the positive relation between agreeableness and school achievements was observed (Hakimi et al., 2011; Komarraju et al., 2011; Meyer et al., 2019). This result indicates that pro-social behaviour and attitudes towards another individual may not always be helpful in gaining high school achievements and sometimes, as observed in the current study, hinder them. In a post hoc analysis, it was observed that among the three subscales of agreeableness (empathy, helping behavior, and prosocial behavior), only helping behavior differentiated girls and boys in explaining school achievements. This may indicate that girls who are more willing to help others may put their peers' school goals above their own school goals and, as a result, gain lower school achievements, moreover, they may be too dependent on other peers and this makes it difficult to look after their own interests (O'Connor, Paunonen, 2007). Heineck (2011) observed a negative relationship in women between agreeableness and the amount of earnings, which may indicate that in some situations excessive agreeableness may have an adverse effect on some aspects of daily functioning.

Another observed difference in explaining school achievements based on gender was inferiority (neuroticism subscale). Inferiority was significantly negatively associated with school achievements in girls and was insignificant in boys. This result suggests that inferiority is only relevant in explaining school achievement in girls. Moreover, it indicates that girls who do not believe in their abilities have lower school achievements, which is consistent with the results of Freudenthaler and colleagues (2008). Furthermore, the research outcomes indicate a higher prevalence of inferiority in girls compared to boys. This aligns with the broader understanding that girls often face societal pressures, gender stereotypes, and higher expectations, which can contribute to a height-

ened sense of inferiority (Bertocchi, Bozzano, 2020). Achievement pressure, specifically experienced by girls, can exacerbate this sense of inferiority. Girls may internalize negative opinions, criticisms, or setbacks, perceiving them as personal failures rather than learning opportunities. Consequently, the emotional difficulties arising from this heightened sense of inferiority can hinder their ability to reach their full potential and attain high academic achievements (Freudenthaler et al., 2008; Golsteyn, Schils, 2014; Steinmayr, Spinath, 2008).

The last difference in explaining school achievements in terms of gender was observed for problem solver subscale, belonging to the scale of openness to experience. The problem solver subscale is significantly positively related to school achievements in boys and not significantly in girls. The problem solver subscale refers to the description of such behaviours as interest in new things and curiosity (Costa, McCrae, 1992; Oleś, 2010). Therefore, boys who are more interested in various new school tasks and are more willing to solve such tasks will gain higher school achievements (O'Connor, Paunonen, 2007). Given the difference in the problem solver subscale for boys and girls, the overall role of openness to experience in explaining school achievements, and the significant differences in openness to experience between girls and boys, it can be assumed that openness to experience may be one of the explanatory factors for why school-age girls achieve higher grades than boys.

Considering the above results, it can be hypothesized that boys have lower school achievements in primary school because they have lower intellectual ambition than girls. On the one hand, boys achieve the same results in intelligence tests as girls (Peterson et al., 2017; Rabiner et al., 2016) and on the other hand, they have lower results than girls in openness to experience, which is related to the intellect (Freudenthaler et al., 2008; Malykh, 2017). This discrepancy in openness to experience between boys and girls may affect their engagement in learning. With a lower level of openness to experience, boys may show less interest in school matters, including school subjects, and may

display less willingness to solve school tasks (Schwaba et al., 2017). This reduced interest and motivation may contribute to their lower academic achievement in primary school.

Limitations and future directions

The current study has several limitations. The results of the conducted analyses reveal only possible causal relationships that should be confirmed in longitudinal studies. Some of the results in the conducted study indicate new relationships between variables not observed so far in other studies, such as the relationship of agreeableness with school achievements only in the group of girls, which indicates some caution when interpreting these results until similar results are observed in other studies. Additionally, the results pertaining to the Big Five subscales, namely inferiority, helping behavior, and problem solver, should be interpreted with caution as they were derived from exploratory post-hoc analysis. Furthermore, it is important to note that each of these subscales is based on only three items, which suggests the need for future investigations to explore these constructs in more depth using longer questionnaires.

Although school-aged children are capable of self-reflection and measurement methods are expected to yield satisfactory psychometric properties, it is important to note that their personality undergoes continuous dynamic development. Additionally, the intensity of personality traits may vary throughout different stages of life. Therefore, the divergent results obtained in the conducted research compared to those obtained in adolescents may be attributed to the specific nature of personality traits in children around the age of 10, which could significantly differ from those observed at other stages of development, such as in adolescents and adults.

The research sample only applied to 4th grade elementary school students and was not large. The effect sizes of some relationships between variables was small or modest, which may indicate that there are other important variables not taken into account in the study that would predict school achievement to a greater extent and would differentiate the group of girls and

boys to a greater extent. In the future, the study should be extended to more primary school grades and the study should be carried out in other cultures. In addition, future research may be focused on a more detailed explanation of the relationship, e.g. between girls' agreeableness and school achievements, using other personality traits such as self-esteem, self-efficacy or through socio-emotional competence.

Implications

Despite some limitations of the study, the obtained results indicate a distinct role of personality traits in explaining school achievement among school-aged children, compared to studies conducted with adolescents. Furthermore, the findings suggest that the factors influencing high academic performance may differ between girls and boys. Therefore, these results have implications for future research on the role of the Big Five traits in school achievement in primary school, while also considering the role of gender.

To summarize, the current study is among the first to demonstrate how Big Five personality traits can predict school achievement based on gender. In the case of girls, inferiority, agreeableness, and related helping behavior are significant factors. For boys, the problem solver subscale which is part of openness to experience plays an important role in school achievements. These findings indicate that boys and girls experiencing academic difficulties should receive slightly different care and support from specialists in primary school. Tailoring interventions to the specific needs of boys and girls can potentially lead to more effective outcomes. Therefore, it is vital for professionals in educational settings to implement interventions that aim to enhance girls' self-esteem and self-efficacy, while also fostering curiosity about lessons and assignments among boys (Zhou, 2015). By focusing on these areas, educators can contribute to narrowing the gender gap in academic achievement.

Specifically, interventions should target the development of girls' self-esteem and self-efficacy. By fostering positive self-esteem and self-confidence, girls can feel more assured in

their academic pursuits. Additionally, interventions should aim to stimulate curiosity among boys, thereby enhancing their interest in school matters and subjects. One effective approach is to provide adequate training in managing stress within the school environment. This training can equip emotionally vulnerable girls with the tools to effectively cope with stress and academic challenges, ultimately leading to improved academic performance (Kraag et al., 2006). Moreover, teachers play a crucial role in supporting students' educational development. For boys, it is important to emphasize the value of the learning process itself, rather than solely focusing on the outcome.

By promoting questioning, conducting research, and encouraging alternative ideas, teachers can help boys develop a deeper understanding of the subject and foster critical thinking skills (Jirout, 2020; Zhou, 2015).

In conclusion, interventions in schools should prioritize improving self-esteem and self-efficacy in girls, while also promoting curiosity in boys. By providing appropriate stress management training and creating a supportive learning environment, teachers can help reduce the gender gap in academic achievement and facilitate a more inclusive and engaging learning experience for all students.

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