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# Are there sex and grade differences in structure and levels of HEXACO-MSI-E personality traits in adolescents? A cross-sectional study

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ABSTRACT

This paper investigated grade-related and sex differences in structure and mean levels of HEXACO traits in two samples of Italian middle-school adolescents, using self-report (N = 1707) and parental perspectives (N = 403). Results suggested that HEXACO traits are already formed by around age 10 or 11 and remain stable across middle-school grades. Compared to students in lower grades, adolescents in higher grades exhibited lower levels of Honesty-Humility, Emotionality, Agreeableness and Conscientiousness, although the lower levels of Agreeableness observed was due only to girls. Girls scored higher on self-reported Emotionality and Openness to Experience, whereas boys scored higher on Extraversion and Agreeableness. In general, facet-level analyses mirrored trait-level sex and grade differences. Finally, parents reported fewer sex differences than adolescents.

## 1. Introduction

Understanding grade-related differences in personality during adolescence represents an important topic in developmental psychology, as this period involves profound biological, cognitive, and social transitions that shape individuals' patterns of behavior, emotion, and thought (Blakemore, Burnett, & Dahl, 2010; Lenroot & Giedd, 2010).

Although personality development has been extensively studied through the lens of the Big Five model, relatively few studies have examined these processes using the HEXACO framework (Ashton & Lee, 2007, 2020). The inclusion of the Honesty–Humility dimension within the HEXACO model allows for the exploration of moral and prosocial aspects of personality that are not fully captured by the Big Five's Agreeableness, thus offering a broader understanding of personality change during this critical developmental stage.

The present study aims to examine grade-related differences in both the structure and mean levels of HEXACO personality traits and facets across groups of early adolescents (10–14 years old), through a cross-sectional study comparing 6th, 7th and 8th grades. By adopting both self-report and parent-report (parents or legal guardian) perspectives, the study investigates whether the differences observed between grade groups are consistent with patterns that have been interpreted in the literature as reflecting gradual maturation, as proposed by the *maturity principle* (Roberts et al., 2006; Soto et al., 2011) or are characterized by temporary disruptions in socially desirable traits, as suggested by the *disruption hypothesis* (Denissen et al., 2013; Soto & Tackett, 2015). Moreover, considering potential sex differences in personality change (De Bolle et al., 2015; McCrae et al., 2002), the study contributes to clarifying how biological and psychosocial processes jointly shape adolescents' personality profiles within the HEXACO framework.

### 1.1. Big Five and HEXACO

Personality is composed of various traits that manifest themselves in behaviors, thoughts, and emotions. These traits can vary over time, be influenced by life experiences, biological changes, and environmental factors (Baumert et al., 2017; Costa et al., 2019). Most studies on personality are grounded in factorial models; among these, two of the most widely used models are the Big Five and the HEXACO.

The Big Five model divides personality into five main dimensions: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. The HEXACO, on the other hand, expands this model by adding a sixth dimension, Honesty-Humility, that captures elements of moral integrity and fairness that are not fully encompassed by the Big Five's Agreeableness (e.g., Ashton & Lee, 2007). From an evolutionary standpoint, Honesty-Humility is theorized to reflect reciprocal altruism, encompassing fairness, sincerity, modesty, and the avoidance of exploitation in interpersonal exchanges; these tendencies

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promote cooperation and regulate social behavior in contexts requiring trust and fairness (Ashton & Lee, 2007; Lee & Ashton, 2012). Although both Honesty–Humility and Agreeableness are related to prosocial behavior, they capture distinct aspects. Honesty–Humility primarily reflects sincerity, fairness, and the avoidance of exploitation, whereas Agreeableness concerns tolerance, forgiveness, and the regulation of anger in response to interpersonal conflict (Ashton, Lee & de Vries, 2014). Thus, the former is more closely related to fairness and non-exploitation, whereas the latter reflects interpersonal reactivity and conflict management.

The HEXACO also reorganizes two other dimensions compared to the Big Five, namely Neuroticism and Agreeableness. Neuroticism is replaced by Emotionality, which includes emotional attachment, sentimentality, dependence, and importantly, anxiety, and reflects evolutionary mechanisms related to social cooperation and interpersonal behavior, by supporting threat sensitivity, caregiving, and the regulation of social bonds within familial contexts. Together, these processes highlight how Emotionality integrates both emotional empathy and protective vigilance, essential for survival and close social relationships (Ashton & Lee, 2020).

Agreeableness in the HEXACO, unlike in the Big Five, emphasizes gentleness and forgiveness, flexibility and patience, excludes sentimentality, and incorporates aspects related to (reversed) anger. Agreeable persons' adaptive behavior is founded on reciprocal altruism values and benefit of cooperation, mutual help, and future collaboration with other people. These adjustments, combined with the addition of Honesty-Humility and the reconceptualization of Emotionality, provide a stronger theoretical foundation than the Big Five by linking personality traits to broader evolutionary mechanisms. In particular, Honesty-Humility and Agreeableness have been associated with tendencies related to cooperation and prosocial behavior, whereas Emotionality has been linked to processes underlying social bonding, empathy, and sensitivity to interpersonal relationships. This framework makes the HEXACO particularly suited for studying adolescence, a period during which social motivations, empathy, and moral reasoning undergo rapid reorganization (Krettenauer et al., 2019; Steinberg, 2008).

### 1.2. Personality development in adolescence: maturity vs. disruption

The literature indicates that, during adolescence, major changes in biological (Lenroot & Giedd, 2010), cognitive (Blakemore, Burnett, & Dahl, 2010; Colom & Lynn, 2004), and psychosocial (Hunter & Youniss, 1982; Rice & Mulkeen, 1995) functioning occur that can affect personality traits and their development over time. Mean-level changes in children's and adolescents' personality traits are often discussed in the context of two perspectives: the maturity principle and the disruption hypothesis (Brandes et al., 2021).

In the Big Five framework, the maturity principle posits that individuals tend to become more conscientious, agreeable, and emotionally stable as they transition from adolescence to young adulthood (Roberts et al., 2006; Soto et al., 2011; Bleidorn et al., 2013; Slobodskaya & Kornienko, 2021). This developmental trend in socially desirable traits reflects increasing social responsibility and self-regulation, consistent with the expectations associated with adult roles. However, such patterns are typically not observed from childhood to early adolescence, a period often characterized by temporary mean-level declines in socially desirable traits (Denissen et al., 2013; Soto & Tackett, 2015).

To explain these age-specific patterns, the disruption hypothesis suggests a transient decrease in traits such as Agreeableness, Conscientiousness, and Openness to Experience during early adolescence, followed by a recovery or increase in late adolescence and early adulthood (De Fruyt et al., 2006; Denissen et al., 2013; Luan et al., 2017; Soto et al., 2011; Soto & Tackett, 2015; Slobodskaya & Kornienko, 2021). This disruption pattern is thought to reflect a temporary shift toward lower self-regulation and increased assertiveness or resistance, resulting from the stress and social reorganization typical of adolescence (Soto & Tackett, 2015).

Although this pattern has been observed in both cross-sectional and longitudinal studies, the exact timing of the disruption process remains unclear (Jones et al., 2022), with some studies suggesting an earlier onset, at about ages 9–10 (Soto et al., 2011; Tackman et al., 2017), and others suggesting a later onset, at about ages 12–13 (De Fruyt et al., 2006). On the other hand, some studies (e.g., McCrae et al., 2002) have highlighted the stability of specific personality traits (e.g., Extraversion, Agreeableness, and Conscientiousness) during this period. Furthermore, from a parent-report perspective, Luan and colleagues (2017) reported that, at age 12, parents rated their children as more neurotic and open, but less conscientious than the adolescents rated themselves.

In their review of studies that have adopted the HEXACO model, Ashton and Lee (2016) found that, in adolescents aged between 14 and 19, Honesty-Humility decreased, Extraversion and Conscientiousness increased, Agreeableness remained constant, while Emotionality and Openness to Experience showed a U-shaped pattern, even if facets did not always correspond to their respective traits. Lee and Ashton (2023) found that, from 14 to 17 years, Honesty-Humility, Conscientiousness, and Extraversion showed a slight downward trend, Emotionality showed a flat trend, Agreeableness and Openness to Experience showed an upward trend. A more recent study by Brazil et al. (2025) found that adolescents, assessed across three time points over a four-year period (10–14 years of age), showed declines in all personality traits except for Emotionality and Openness to Experience, which exhibited a flat trend.

### 1.3. Facets, age and sex differences, and structural differentiation

Regarding facets, which are specific subcomponents of personality traits, interesting results have emerged. Facets provide a more detailed view of personality and may not always follow the same mean-level trends as their corresponding broader traits, particularly in adolescence. For instance, De Fruyt and colleagues (2006) showed that, in early adolescence, mean levels of self-confidence and anxiety (both facets of Neuroticism) did not necessarily correspond: self-confidence exhibited a flat trend, whereas anxiety levels decreased.

de Haan et al. (2017) found that differences in mean-level changes between facets belonging to the same trait domain are typically not large but seem to become larger as individuals grow older (i.e., enter middle adolescence). Similarly, Soto et al. (2011) found that mean levels of anxiety and depression in early adolescent girls (10–14 years old) were higher compared to boys. These findings were based on the Big Five model, whereas studies on HEXACO personality development are rare.

In one of these studies, Ashton and Lee (2016) examined adolescents between 14 and 19 years and found that Honesty-Humility facets showed a decreasing trend across the teen years; Emotionality facets showed different patterns: Fearfulness and Sentimentality decreased, while Anxiety and Dependence increased, and all Extraversion and Conscientiousness facets increased. Instead, age differences in Agreeableness facets were small from 14 years onwards and, finally, all the Openness to Experience facets showed an increasing trend across the teen years.

In a more recent study based on a South Korean sample, Lee and Ashton (2023) examined a narrower age range (approximately 14 to 17 years) and reported somewhat different patterns. Adolescents in this age range showed lower levels across all Honesty–Humility and Conscientiousness facets. Within Emotionality, Sentimentality showed slightly higher levels, Dependence and Fearfulness showed slightly lower levels, and Anxiety exhibited a flat trend. Extraversion facets showed lower levels during this age range and slightly higher levels thereafter, whereas Agreeableness facets followed a U-shaped pattern, with lower levels in mid-adolescence. Within Openness to Experience, Inquisitiveness showed a flat trend during this age range and showed higher levels later in life, while Creativity showed lower levels, and both Aesthetic Appreciation and Unconventionality displayed higher levels.

Differences between these studies may be partly attributable to differences in age range (mid-adolescence vs. a broader span extending into late adolescence), as well as to cultural and sample characteristics, which may account for the observed variation in age-related patterns. In light of the above, age-related differences may influence specific facets differently from broader traits. Facets capture more detailed and specific aspects of personality that can be more sensitive to variation associated with developmental processes and life experiences (Slobodskaya & Kornienko, 2021).

Another important variable to consider for a more complete picture of personality development in adolescence is gender/sex. While extensive studies have consistently identified sex-based differences in adults' personality traits, our understanding of these differences in adolescents and how age interacts with them is still evolving. The biological, psychological, and socio-emotional changes occurring during adolescence (Blakemore et al., 2010; Lenroot & Giedd, 2010), and their timing, may differ between boys and girls, further emphasizing the complexity of adolescent development (Marshall & Tanner, 1986). Some studies have reported that in early adolescence, girls tend to score higher than boys in Extraversion and Openness (McCrae et al., 2005; McCrae et al., 2002), whereas others found the opposite pattern (Branje, Van Lieshout, & Gerris, 2007).

In terms of Agreeableness and Neuroticism, Gullone and Moore (2000), and subsequently McCrae and colleagues (2002) found higher levels in girls (see also Costa et al., 2019), whereas Branje et al. (2007) observed no significant gender differences in these two dimensions.

Anderson et al. (2001) reported that around the ages of 12 or 13, girls transitioned from lower to higher levels in a range of executive functioning tasks compared to boys, although this effect seemed to diminish by age 15, reflecting overlaps between Conscientiousness and executive functioning, defined as the ability to engage in purposeful and planned behavior encompassing organizing, executing, persisting, and regulating goal-directed activities (Fuster, 2001, 2002).

Consistently, girls tend to score higher on Openness and Conscientiousness in early adolescence, with lower levels thereafter (De Bolle et al., 2015), and sex differences in Neuroticism, with girls scoring higher than boys, begin to emerge around age 14. Parent-reported traits also indicate that, during adolescence, girls showed higher levels of Conscientiousness, Agreeableness, and Extraversion, whereas boys showed lower levels of Openness and Extraversion (Branje et al., 2007).

It should be noted that these findings are based on studies using the Big Five framework rather than the HEXACO model. As far as we are aware, no research has specifically examined sex differences in adolescents' HEXACO personality traits.

So far, we have addressed issues related to the development of average trait levels. However, there is another important aspect of personality, which becomes particularly relevant in adolescence. Conceptually, this aspect is preliminary to the change in levels because it concerns the development of personality structure. Structure refers to changes related to the number, nature, and development of personality dimensions over time; for example, testing measurement invariance across grades or ages is a way to detect if the number of factors and their contents are equivalent (or change) over time (e.g., Gnisci et al., 2023). In general, structural change can be identified by changes in time in the number of the dimensions (invariance), by the lowering of the correlations between factors (differentiation) and by the increase of the internal consistency within each factor (homogeneity).

The evidence for structural differentiation of personality traits in adolescence is mixed and mainly based on the Big Five rather than the HEXACO model. Using the Big Five, Soto et al. (2008) found that from age 10 onward, all personality traits except for Extraversion showed age increased differentiation with age, whereas Allik et al. (2004) found that personality traits at age 12 were less differentiated than those of older adolescents, as younger adolescents showed higher correlations between Agreeableness and Conscientiousness ($r = 0.49$), which decreased with age ($r = 0.18$), suggesting that they initially tended to fuse sympathy and cooperation towards others with self-control and determination (see also Sergi et al., 2020). Instead, in adolescents aged between 14 and 18, Ober et al. (2021) found that domain-level differentiation was weak or almost negligible, indicating that the Big Five domains were largely independent.

Using the HEXACO model, Gnisci et al. (2023) found that the six-factor dimensionality of adolescents' personality was invariant across three middle school classes groups. In addition, there was a high level of differentiation between traits (correlations $< |.30|$) as early as age 10 and the internal consistency of each trait and facet was similar in the three grade classes (Mottola et al., in press). Finally, in a three-wave longitudinal investigation of 9–14 years old adolescents (at Wave 1), Brazil et al. (2025) found that within-wave factor correlations ranged from a low of 0.01 (Extraversion and Openness to Experience in Wave 1) to a high of 0.41 (Honesty-Humility and Agreeableness in Wave 2), suggesting that the latent factors were generally well differentiated. Indeed, although some correlations between factor scores were relatively high, the overall pattern of factor intercorrelations was quite low, as illustrated by mean absolute correlations of $|r| = 0.18$ at Wave 1 and $|r| = 0.15$ at both Waves 2 and 3 across all six factors.

### 1.4. The present study

This study is part of a broader project, called EMERGE, whose general aim was to build and validate a measurement instrument of personality for 10–14 years old adolescents, representative of the HEXACO model and called HEXACO – Medium School Inventory – Extended (HEXACO-MSI-E). The two data collections used here are derived from this project (cf. Gnisci et al., 2023; Mottola et al., 2023; Sergi et al., 2024). The research questions, use of variables, and statistical analyses are novel and completely different from previous contributions.

The general aim of this cross-sectional study is to examine whether, and eventually how, three groups of boys and girls of 6th, 7th and 8th grade of middle school (10–14 years) differ as for HEXACO personality traits and facets, from both self-report (SR) and parental (PR) perspective. Specifically, two research questions guided the study.

Research Question 1 (RQ1). The first research question concerns the structural aspect of adolescents' personality and, particularly, the differentiation of personality traits. Previous studies have demonstrated the dimensional validity and measurement invariance of HEXACO traits in middle school adolescents (Sergi et al., 2020) and in a larger sample including the present one (Gnisci et al., 2023). This research question extends prior work by examining whether the correlations among traits change between 6th, 7th and 8th grade groups. Establishing structural consistency is essential to verify whether personality differentiation occurs during early adolescence and to ensure that any subsequent mean-level changes can be fully interpreted.

Research Question 2 (RQ2). Once the structural aspect of personality is established, the second research question focuses on differences in mean levels of personality traits and facets between groups of boys and girls of 6th, 7th and 8th grade. This question allows us to evaluate whether adolescents' personality follows a maturation trajectory or exhibits temporary declines in socially desirable traits. We utilized grade as the primary grouping variable in our analyses, as it provides a more accurate representation of adolescents' shared educational experiences and social environments than chronological age. Grade constitutes a more contextually meaningful variable for school-based research. Students within the same grade level typically encounter comparable academic demands, peer-group dynamics, and institutional expectations, all of which can shape patterns of personality differences (Eccles & Roeser, 2011). Conversely, adolescents of the same chronological age may be distributed across different grades and thus exposed to distinct social and learning contexts. Accordingly, using grade as a grouping variable offers a more ecologically valid depiction of adolescents' personality differences within educational settings.

To refine this inquiry, RQ2 was articulated into two more specific

questions:

a) RQ2a examines mean-level changes associated with grade (i.e., age related differences), assessing how traits and facets change (e.g., increase, decrease, or exhibit a flat trajectory) across the three (6th, 7th and 8th grades) groups of middle school years;
b) RQ2b investigates sex-related differences in personality change, testing whether the mean levels in personality traits and the patterns observed differ between girls and boys.

## 2. Materials and methods

### 2.1. Participants

The total participants to this study were 2.100, of which 1707 (74.93% of students who were invited) were middle school adolescents and 403 parents or legal guardians (29.03% of parents/legal guardians who were invited). Regarding adolescents, data were collected in two independent samples of middle school students at two different times. Sample 1 consisted of 714 participants (52.7% girls; Mean Age = 11.94, SD = 0.91), while Sample 2 consisted of 993 participants (52.2% girls; Mean Age = 11.94, SD = 0.90; age range = 10–14). The overall sample of middle school students (52.4% girls; Mean Age = 11.94, SD = 0.90) was recruited from fourteen schools of Campania (South Italy), 43.5% attending the 6th, 32.2% the 7th and 24.3% the 8th grade. The adult sample consisted of parents or legal guardians of the adolescents from Sample 2 who agreed to participate in the research.

### 2.2. Procedures

*Recruitment and Informed Consent.* The research plan received approval from the local Ethics Committee of the first author's Department (approval number 13/26.05.2020). Then, it was approved by the Directors of the schools and by their Councils.

Parents and adolescents were informed about the study by the school, by the research assistant, by written instructions, and by video- and audio-recordings, specially prepared. After being informed, the parents/legal guardians were administered (online) the protocol, at the beginning of which they read the basic information related to the research and then provided, if they desired, the consent to the participation for their children and then for themselves. At the beginning of their online protocol, the adolescents also read a written description of the research and were asked about their willingness to participate.

The adolescents and their parents were informed that they were free to decline to take part in data collection at any time and without any consequence. It was also specified that the responses were recorded anonymously, and data were treated collectively.

*Administration.* Data collection took place between May and June 2020 for Sample 1 and between April and May 2021 for Sample 2. In accordance with the ministerial indications during pandemic, the participating schools provided distance education, using online platforms, with the activation of virtual classrooms to guarantee the continuity of students' learning. For this reason, adolescents were administered the online protocol in their virtual classrooms by research assistants and in the presence of the teacher. Participants completed the online protocol using the Qualtrics platform.

### 2.3. Measures

*Demographic Information.* At the beginning of the protocol, basic information such as sex, age, school, class, and parental information (i.e., educational level and professional status) were requested. Sex represented biological sex assigned at birth, Grade reflected if the adolescents were frequenting 6th, 7th or 8th grade.

*Self-report HEXACO-MSI-E.* To measure the six broad personality dimensions (Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience), Sample 1 was administered an initial version of HEXACO-MSI-E formed by 384 items, from which we derived the final 190-item scale used here (see also Gnisci et al., 2023). Sample 2, instead, was administered a version of the HEXACO-MSI-E consisting of 219 items from which we selected the best 192 items which represented the definitive version of HEXACO-MSI-E (Gnisci et al., 2023). Participants answered using a 5-point Likert scale from 1 (*True*) to 5 (*False*).

For the 190-item scale (Sample 1), Cronbach's α ranged between 0.85 and 0.92 for factors and from 0.44 to 0.85 for facets; for the 192-item version (Sample 2), Cronbach's α ranged between 0.89 and 0.93 for factors and from 0.59 to 0.87 for facets (all values reported in Gnisci et al., 2023).

The two versions of HEXACO-MSI-E administered (190-item vs. 192-item) shared 169 items and differed on 23. Both versions were shown to adequately measure the six traits of the HEXACO model (for more details see Gnisci et al., 2023).

*Parent-report HEXACO-MSI-E.* Parent reports (PR), provided by parents or legal guardians, were collected for a subsample of adolescents. We used the same version of the HEXACO-MSI-E described above, composed of 219 items, but worded in the third person, to obtain a parent-reported evaluation reported by a parent. For the parent-report version of the HEXACO-MSI-E (referred to as "Obs" in the validation work by Mottola et al., 2023), Cronbach's α ranged between 0.88 and 0.95 for factors and from 0.58 to 0.91 for facets.

The definitive versions of the HEXACO-MSI-E are available in self- and parent-report forms (the latter referred to as "Obs HEXACO-MSI-E" in the validation work by Mottola et al., 2023), in both female and male versions at the webpage: https://www.psicologia.unicampania.it/strumenti-di-misura..

### 2.4. Data analysis

In this study, grade was used as the primary grouping variable. Age and grade were strongly and significantly correlated ($N = 1707$, $r = 0.87$, $p < 0.001$).

In RQ1, we examined, in Sample 1 and 2, the differences in discrimination between different traits across groups of adolescents of 6th, 7th and 8th. Preliminary analysis of trait invariance confirmed full measurement invariance (see Table SM1 in the Supplementary Materials, hereafter SM). Once the structural invariance was demonstrated, we proceeded to test our first research question. Specifically, using the facet scores derived from ipsatized data (Thalmayer et al., 2020) the equivalence of correlations among the six traits was tested.

In particular, the equality of correlations among each dimension was tested by comparing the variance–covariance matrices of the latent variables. In this test, a model constraining the full measurement invariance and the equality of the latent variance–covariance matrices across the three groups (model B) was compared to the model where the correlations among traits were not constrained to be equal (model A) using a multi-group hierarchical confirmatory factor analysis (Vandenberg & Lance, 2000). Analyses were performed with LISREL 10.3.4.4 software. The robust maximum likelihood (RML) estimation method was used to estimate parameters.

To test the goodness-of-fit of the models, $ML\chi^2$ test-statistics were used in conjunction with the root mean square error of approximation index (RMSEA), the non-normed fit index (NNFI), and the comparative fit index (CFI) that have proven to be less dependent on sample size (Cheung & Rensvold, 2002). To test the relative fit of hierarchical nested models, the difference in $ML\chi^2$ statistics ($ML\chi^2_{diff}$), CFI values ($CFI_{diff}$), and RMSEA ($RMSEA_{diff}$; Cheung & Rensvold, 1999, 2002) were used (Vandenberg & Lance, 2000). In the event of a discrepancy between these indices, because $\chi^2$ is very sensitive in large samples, the criterion of a 0.01 change in CFI and of 0.015 change in RMSEA was considered (Chen, 2007; Cheung & Rensvold, 2002) as more informative.

For RQ2a and RQ2b, firstly, the effects of Sex (Girls vs. Boys) and

Grade (6th, 7th, and 8th) with Collection as covariate (that is, membership to Sample 1 or Sample 2) on both the six self-reported HEXACO traits and on the 24 self-reported HEXACO facets were estimated separately with two sets of ANCOVAs. Then, the same analyses without the covariate were executed on parent-report traits and facets. Effect sizes for differences related to Sex and Collection were calculated using Cohen's *d* (all the effects sizes are reported in Tables 3 and 4).

Significant Sex × Grade interactions were probed with simple effects analysis, in which the polynomial contrasts for Grade (linear and quadratic) were evaluated for the two sexes. Each significant Sex × Grade interaction was interpreted providing the graph of the trends of each personality trait or facet separated for female and male adolescents in 6th, 7th and 8th grade, the linear contrasts for the two sexes, and, finally, *t*-test comparisons between boys and girls within each grade. All the detailed descriptions of the interaction effects are reported in the SM.

Means and standard deviations for the whole sample, for girls and boys, for the 6th, 7th and 8th also are provided in the SM. All the analyses were corrected for multiple testing using the False Discovery Rate test (Benjamini & Hochberg, 1995).

## 3. Results

### 3.1. RQ1: difference in discrimination between different traits across 6th, 7th and 8th grade groups

To understand if traits differentiate across the three groups of grades, multi-group hierarchical confirmatory factor analyses were performed in both Sample 1 and 2. In Table 1, Model A represents the model in which correlations among traits were not constrained to be equal in the three groups, whereas Model B imposes the full measurement invariance and constrains the latent variance–covariance matrices to be equal across the three groups.

Results (Table 1) show that, although the ML$\chi^2_{diff}$ highlights a significant difference between the constrained model (Model B) and the unconstrained model (Model A), the $CFI_{diff}$ and $RMSEA_{diff}$ indexes show that the difference is trivial. Therefore, Model B is preferred, providing evidence for substantial equivalence in the correlations among traits across 6th, 7th and 8th grades.

To provide a comprehensive summary of the correlations, Table 2 reports, for both samples, the average of all the correlations for each grade, as well as the average correlations of each trait with all other traits for each grade (each single correlation between different traits in different grades in both samples can be found in Table SM2 of SM). Average correlations across traits were generally similar across grades in both samples (see Table 2). Although the overall average in 8th grade for Sample 1 was slightly lower, this difference is not sufficient to indicate a lack of structural equivalence.

Furthermore, the variation in the average correlations of each trait with the others (Table 2), remains minimal across the three grades.

**Table 2**
Within group correlations among the six factors as a function of the study and the class.

| | Sample 1 | | | Sample 2 | | |
|---|---|---|---|---|---|---|
| Grade | 6th | 7th | 8th | 6th | 7th | 8th |
| H | .38 | .39 | .25 | .36 | .36 | .38 |
| E | .22 | .19 | .18 | .22 | .20 | .21 |
| X | .24 | .25 | .28 | .31 | .28 | .24 |
| A | .41 | .38 | .14 | .40 | .31 | .32 |
| C | .38 | .45 | .31 | .41 | .37 | .36 |
| O | .38 | .41 | .21 | .36 | .31 | .28 |
| Average | .33 | .34 | .23 | .34 | .30 | .30 |

*Note.* For each row the average correlation of that trait with all the other traits is reported. The final row average contains the average values of all the correlations.

### 3.2. RQ2: differences in mean levels of traits and facets

Differences in mean levels of personality traits and facets were examined as a function of grade (6th, 7th and 8th) and sex in both the self- (Sample 1) and the parent-report samples (Sample 2).

#### 3.2.1. Grade effects

The results revealed significant grade-related differences across several domains. In the self-report sample, polynomial contrasts showed that levels of Honesty-Humility, Emotionality, Agreeableness, and Conscientiousness lowered across the three grade groups (Table 5) with patterns illustrated in Figs. 1 and 2, and Figure SM9-SM10 (in SM). Facet-level analyses provided a more detailed picture of these differences. Fourteen out of 24 facets showed significant difference across grades (6th, 7th and 8th). For most of these facets, levels were lower in higher grades (see Table 5; Figs. 1 and 2, Figures SM9-SM10, and Figure SM11 of SM, the latter for Sociability). The exception was Unconventionality of Openness to Experience, for which older adolescents reported higher scores (see Figure SM11 in SM).

In the parent-report sample, grade-related differences were more circumscribed. Polynomial contrasts indicated that Emotionality linearly lowered among older adolescents, replicating the pattern observed in self-report analyses (see Table 6). At the facet level, only Fearfulness (Emotionality) and Forgivingness (Agreeableness) facets showed significant difference across grades (6th, 7th and 8th) with lower levels observed among older adolescents (see Fig. 3).

#### 3.2.2. Sex effects

Clear sex differences emerged. Girls scored higher, on average, on Emotionality and Openness to Experience, whereas scored higher on Extraversion and Agreeableness (see Table 5). Facet-level analyses provided a more detailed picture of these differences. Seventeen out of 24 facets showed significant differences between sexes (see Table 5). Most of these belonged to dimensions that were already significantly affected by Sex at the trait-level, with two additional facets (Diligence and Perfectionism of Conscientiousness). On average, girls scored higher

**Table 1**
Equivalence analysis across Grades as a function of the Study (Study 1: C1: n = 336; C2: n = 243; C3: n = 123; and Study 2: C1: n = 400; C2: n = 300; C3: n = 289).

| Model | *RMSEA* | *CFI* | *NNFI* | *ML*$\chi^2$ | *Df* | *ML*$\chi^2_{diff}$ | $df_{diff}$ | $CFI_{diff}$ | $RMSEA_{diff}$ |
|---|---|---|---|---|---|---|---|---|---|
| **Sample 1** | | | | | | | | | |
| Model A | .071 | .960 | .960 | 1799.15*** | 823 | | | | |
| Model B | .071 | .961 | .963 | 1877.08*** | 865 | 77.93*** | 42[a] | -.001 | 0 |
| **Sample 2** | | | | | | | | | |
| Model A | .072 | .959 | .958 | 2217.29*** | 823 | | | | |
| Model B | .071 | .959 | .960 | 2279.53*** | 865 | 62.24* | 42[a] | 0 | -.001 |

*Note.* Model A: six-factor full invariance model. Model B: six-factor full invariance model with equal factor variance–covariance. [a]The reference model is Model A. *** $p < 0.001$; ** $p < 0.01$.

**Table 3**
Descriptive data (mean and standard deviation) and Cohen's *d* of the Self Report HEXACO facets for the whole sample, for Sex and Grades.

| | Sample | Sex | | | Grade | | | Collection | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $\bar{x}_{GEN}$ (SD) | $\bar{x}_F$ (SD) | $\bar{x}_M$ (SD) | *d* | $\bar{x}_{6th}$ (SD) | $\bar{x}_{7th}$ (SD) | $\bar{x}_{8th}$ (SD) | $\bar{x}_1$ (SD) | $\bar{x}_2$ (SD) | *d* |
| Honesty-Humility (H) | 3.72 (.65) | 3.73 (.68) | 3.71 (.63) | .05 | 3.83 (.62) | 3.69 (.66) | 3.57 (.68) | 3.74 (.63) | 3.71 (.67) | .06 |
| Sincerity (H) | 3.76 (.77) | 3.75 (.79) | 3.76 (.75) | -.02 | 3.86 (.72) | 3.72 (.79) | 3.63 (.80) | 3.78 (.76) | 3.74 (.78) | .05 |
| Fairness (H) | 4.12 (.84) | 4.16 (.82) | 4.08 (.86) | .09 | 4.26 (.76) | 4.11 (.84) | 3.89 (.91) | 4.15 (.79) | 4.10 (.87) | .05 |
| Greed Avoidance (H) | 3.15 (.85) | 3.18 (.87) | 3.15 (.82) | .03 | 3.29 (.85) | 3.12 (.82) | 3.00 (.84) | 3.18 (.81) | 3.16 (.87) | .02 |
| Modesty (H) | 3.84 (.78) | 3.85 (.82) | 3.82 (.73) | .04 | 3.92 (.75) | 3.80 (.80) | 3.75 (.81) | 3.87 (.75) | 3.82 (.80) | .06 |
| Emotionality (E) | 3.25 (.63) | 3.39 (.63) | 3.10 (.59) | .47*** | 3.31 (.63) | 3.26 (.61) | 3.13 (.64) | 3.28 (.58) | 3.23 (.67) | .09 |
| Fearfulness (E) | 2.95 (.90) | 3.07 (.92) | 2.82 (.86) | .28*** | 3.05 (.90) | 3.00 (.88) | 2.72 (.88) | 2.98 (.87) | 2.93 (.92) | .05 |
| Anxiety (E) | 3.54 (.72) | 3.68 (.72) | 3.38 (.68) | .43*** | 3.56 (.72) | 3.53 (.71) | 3.50 (.72) | 3.50 (.71) | 3.57 (.73) | -.10 |
| Dependence (E) | 3.07 (.87) | 3.13 (.91) | 3.01 (.82) | .13* | 3.13 (.88) | 3.07 (.86) | 2.97 (.87) | 3.10 (.80) | 3.05 (.92) | .06 |
| Sentimentality (E) | 3.44 (.91) | 3.67 (.90) | 3.19 (.84) | .55*** | 3.49 (.88) | 3.45 (.90) | 3.33 (.95) | 3.55 (.82) | 3.36 (.96) | .21*** |
| Extraversion (X) | 3.57 (.73) | 3.45 (.77) | 3.71 (.67) | -.36*** | 3.61 (.73) | 3.59 (.72) | 3.49 (.76) | 3.67 (.67) | 3.51 (.77) | .21 |
| Social Self-Esteem (X) | 3.48 (.95) | 3.33 (1.00) | 3.65 (.87) | -.34*** | 3.53 (.96) | 3.50 (.93) | 3.35 (.95) | 3.58 (.92) | 3.41 (.97) | .18** |
| Social Boldness (X) | 3.23 (.89) | 3.15 (.92) | 3.32 (.84) | -.20*** | 3.21 (.88) | 3.24 (.86) | 3.25 (.93) | 3.27 (.82) | 3.21 (.93) | .07 |
| Sociability (X) | 3.93 (.83) | 3.79 (.88) | 4.08 (.73) | -.37*** | 3.99 (.81) | 3.95 (.80) | 3.78 (.88) | 3.99 (.77) | 3.88 (.87) | .14* |
| Liveliness (X) | 3.66 (.86) | 3.54 (.90) | 3.79 (.80) | -.29*** | 3.70 (.83) | 3.68 (.87) | 3.57 (.89) | 3.82 (.78) | 3.54 (.90) | .33*** |
| Agreeableness (A) | 3.09 (.72) | 2.95 (.73) | 3.25 (.66) | -.44*** | 3.20 (.69) | 3.03 (.72) | 2.98 (.73) | 3.00 (.68) | 3.16 (.73) | -.22 |
| Forgivingness (A) | 3.08 (.92) | 2.88 (.92) | 3.30 (.86) | -.47*** | 3.22 (.91) | 3.01 (.88) | 2.91 (.95) | 3.09 (.90) | 3.07 (.94) | .03 |
| Gentleness (A) | 3.51 (.80) | 3.45 (.84) | 3.57 (.75) | -.16*** | 3.66 (.78) | 3.40 (.79) | 3.37 (.81) | 3.28 (.70) | 3.67 (.83) | -.50*** |
| Flexibility (A) | 2.99 (.78) | 2.84 (.80) | 3.14 (.73) | -.39*** | 3.06 (.78) | 2.95 (.80) | 2.92 (.76) | 2.80 (.78) | 3.12 (.76) | -.42*** |
| Patience (A) | 2.80 (1.02) | 2.61 (1.01) | 3.00 (.99) | -.39*** | 2.87 (.97) | 2.75 (1.07) | 2.73 (1.02) | 2.82 (.99) | 2.78 (1.03) | .05 |
| Conscientiousness (C) | 3.33 (.76) | 3.36 (.78) | 3.29 (.73) | .09 | 3.38 (.75) | 3.31 (.78) | 3.25 (.75) | 3.33 (.75) | 3.33 (.77) | .00 |
| Organization (C) | 3.12 (1.05) | 3.15 (1.07) | 3.10 (1.02) | .05 | 3.12 (1.04) | 3.13 (1.08) | 3.12 (1.02) | 3.12 (1.01) | 3.13 (1.07) | -.01 |
| Diligence (C) | 3.55 (.85) | 3.60 (.86) | 3.49 (.82) | .13* | 3.60 (.83) | 3.52 (.85) | 3.50 (.86) | 3.49 (.83) | 3.59 (.85) | -.12* |
| Perfectionism (C) | 3.43 (.96) | 3.52 (.96) | 3.32 (.95) | .20*** | 3.52 (.94) | 3.41 (.97) | 3.27 (.96) | 3.54 (.91) | 3.34 (.98) | .21*** |
| Prudence (C) | 3.21 (.88) | 3.17 (.91) | 3.25 (.84) | -.09 | 3.27 (.85) | 3.19 (.89) | 3.11 (.90) | 3.16 (.87) | 3.24 (.88) | -.09* |
| Openness to Experience (O) | 3.29 (.66) | 3.35 (.68) | 3.22 (.62) | .21*** | 3.28 (.65) | 3.31 (.66) | 3.28 (.66) | 3.28 (.65) | 3.30 (.66) | -.03 |
| Aesthetic Appreciation (O) | 3.07 (1.01) | 3.18 (1.01) | 2.94 (.99) | .24*** | 3.09 (.98) | 3.11 (1.02) | 2.97 (1.03) | 3.03 (1.00) | 3.09 (1.01) | -.07 |
| Inquisitiveness (O) | 3.32 (.93) | 3.28 (.95) | 3.36 (.90) | -.09 | 3.36 (.92) | 3.30 (.93) | 3.28 (.93) | 3.32 (.88) | 3.32 (.96) | .00 |
| Creativity (O) | 3.50 (.84) | 3.58 (.87) | 3.41 (.79) | .20*** | 3.51 (.86) | 3.54 (.83) | 3.44 (.81) | 3.50 (.83) | 3.50 (.85) | .01 |
| Unconventionality (O) | 3.27 (.67) | 3.37 (.69) | 3.16 (.63) | .32*** | 3.18 (.66) | 3.28 (.68) | 3.43 (.64) | 3.26 (.65) | 3.28 (.68) | -.04 |

*Note.* Asterisks indicate FDR-corrected significance levels for the F statistics (*p < 0.05; **p < 0.01; ***p < 0.001) reported in Table 5.

than boys on Fearfulness, Anxiety, Dependence and Sentimentality of Emotionality; Aesthetic Appreciation, Creativity and Unconventionality of Openness to Experience; Diligence and Perfectionism of Conscientiousness. Conversely, boys, on average, scored higher than girls on Social Self-Esteem, Social Boldness, Sociability, Liveliness of Extraversion; Forgivingness, Gentleness, Flexibility and Patience of Agreeableness.

In the parent-report sample, on average, girls were rated higher on Conscientiousness and Openness to Experience, whereas boys on Agreeableness (see Table 6). At facet level, findings were consistent with those observed at the trait level (see Table 6). Specifically, boys were rated higher than girls on Forgivingness, Flexibility and Patience of Agreeableness, whereas girls were rated higher than boys on Diligence and Perfectionism of Conscientiousness, as well as on Aesthetic Appreciation, Creativity and Unconventionality of Openness to Experience. Finally, Sentimentality was also higher in girls than in boys.

### 3.2.3. *Sex × Grade interactions*

Few significant Sex × Grade interactions emerged (see Tables 5–8), indicating that grade-related differences were not uniform across sexes.

In the self-report data, Agreeableness showed a significant interaction, with a clear decline across grades in girls, whereas boys showed relatively stable levels (Fig. 4). At the facet level, four significant Sex × Grade interactions were observed (Figs. 5-8). Specifically, Flexibility and Patience of Agreeableness were lower across grades in girls, whereas they remained stable in boys; Gentleness of Agreeableness was lower across grade groups in both sexes, but the difference was more pronounced among girls. Conversely, Unconventionality of Openness to Experience was higher among older adolescents in both sexes, with the difference emerging earlier for girls (from 6th grade) than for boys (from 7th grade).

In parent-report data, interaction effects were more limited. At the trait level, a significant Sex × Grade interaction was observed for Openness to Experience, indicating that, although boys and girls showed similar levels in 6th grade, their patterns diverged across subsequent grades due to a downward trend in Openness to Experience among boys (Fig. 9). At the facet level, two significant Sex × Grade interactions emerged (Diligence and Perfectionism of Conscientiousness). These interaction effects showed a similar pattern (Figs. 10-11), with girls exhibiting an almost flat trend whereas boys showing progressively lower levels in both facets, particularly between 7th and 8th grade.

## 4. Discussion

The present study examined grade-related and sex differences in personality traits and facets within the HEXACO framework, integrating self- and parent-report perspectives. Overall, the findings indicate systematic differences across grades in several domains of personality, sometimes further qualified by significant Grade × Sex interactions, although the differences were more pronounced in self- than in parent-reports.

**Table 4**
Descriptive data (mean and standard deviation) and Cohen's *d* of the Parent-report HEXACO facets for the whole sample, for Sex and Grades.

| | Sample | Sex | | | Grade | | |
|---|---|---|---|---|---|---|---|
| | $\bar{x}_{GEN}$ (SD) | $\bar{x}_{F}$ (SD) | $\bar{x}_{M}$ (SD) | *d* | $\bar{x}_{6th}$ (SD) | $\bar{x}_{7th}$(SD) | $\bar{x}_{8th}$ (SD) |
| Honesty-Humility (H) | 4.09 (.54) | 4.10 (.57) | 4.08 (.51) | .03 | 4.13 (.50) | 4.09 (.57) | 4.03 (.57) |
| Sincerity (H) | 4.22 (.61) | 4.24 (.62) | 4.19 (.61) | .09 | 4.22 (.60) | 4.22 (.65) | 4.20 (.59) |
| Fairness (H) | 4.59 (.53) | 4.62 (.54) | 4.56(.52) | .11 | 4.59 (.46) | 4.57 (.61) | 4.60 (.53) |
| Greed Avoidance (H) | 3.52 (.86) | 3.53 (.92) | 3.52 (.80) | .01 | 3.60 (.86) | 3.53 (.84) | 3.38 (.88) |
| Modesty (H) | 4.04 (.74) | 4.02 (.77) | 4.06 (.71) | -.06 | 4.11 (.67) | 4.05 (.76) | 3.93 (.82) |
| Emotionality (E) | 3.55 (.57) | 3.61 (.60) | 3.49 (.53) | .20 | 3.65 (.57) | 3.53 (.56) | 3.41 (.54) |
| Fearfulness (E) | 3.34 (.82) | 3.39 (.87) | 3.29 (.76) | .13 | 3.47 (.87) | 3.31 (.81) | 3.16 (.71) |
| Anxiety (E) | 3.73 (.60) | 3.77 (.59) | 3.68 (.62) | .14 | 3.80 (.59) | 3.74 (.59) | 3.60 (.63) |
| Dependence (E) | 3.35 (.84) | 3.38 (.89) | 3.33 (.79) | .07 | 3.49 (.86) | 3.32 (.81) | 3.19 (.84) |
| Sentimentality (E) | 3.77 (.82) | 3.88 (.86) | 3.67 (.77) | .26* | 3.86 (.76) | 3.74 (.87) | 3.68 (.84) |
| Extraversion (X) | 3.83 (.67) | 3.77 (.66) | 3.89 (.68) | -.19 | 3.83 (.66) | 3.83 (.71) | 3.83 (.64) |
| Social Self-Esteem (X) | 3.86 (.73) | 3.81 (.75) | 3.91 (.72) | -.14 | 3.81 (.76) | 3.89 (.73) | 3.90 (.70) |
| Social Boldness (X) | 3.44 (.90) | 3.36 (.87) | 3.52 (.92) | -.18 | 3.39 (.92) | 3.45 (.91) | 3.50 (.85) |
| Sociability (X) | 4.11 (.79) | 4.04 (.82) | 4.17 (.75) | -.17 | 4.18 (.71) | 4.10 (.81) | 3.99 (.86) |
| Liveliness (X) | 3.90 (.81) | 3.85 (.82) | 3.95 (.80) | -.12 | 3.91 (.81) | 3.87 (.86) | 3.93 (.75) |
| Agreeableness (A) | 3.52 (.67) | 3.39 (.69) | 3.65 (.62) | -.40*** | 3.62 (.62) | 3.47 (.64) | 3.41 (.75) |
| Forgivingness (A) | 3.55 (.87) | 3.36 (.90) | 3.74 (.79) | -.45*** | 3.74 (.81) | 3.49 (.81) | 3.32 (.98) |
| Gentleness (A) | 3.95 (.68) | 3.90 (.69) | 4.00 (.66) | -.15 | 4.02 (.67) | 3.93 (.62) | 3.86 (.74) |
| Flexibility (A) | 3.38 (.71) | 3.27 (.73) | 3.49 (.67) | -.31** | 3.50 (.70) | 3.32 (.71) | 3.28 (.71) |
| Patience (A) | 3.19 (1.02) | 3.02 (1.05) | 3.36 (.97) | -.34*** | 3.23 (.97) | 3.15 (1.00) | 3.19 (1.13) |
| Conscientiousness (C) | 3.33 (.82) | 3.43 (.79) | 3.23 (.84) | .25* | 3.30 (.84) | 3.35 (.80) | 3.34 (.82) |
| Organization (C) | 2.83 (1.10) | 2.77 (1.14) | 2.89 (1.07) | -.11 | 2.79 (1.12) | 2.83 (1.12) | 2.89 (1.05) |
| Diligence (C) | 3.69 (.99) | 3.88 (.92) | 3.50 (1.03) | .39*** | 3.72 (.96) | 3.70 (.99) | 3.62 (1.05) |
| Perfectionism (C) | 3.38 (1.04) | 3.61 (.99) | 3.16 (1.05) | .44*** | 3.37 (1.05) | 3.43 (.99) | 3.35 (1.10) |
| Prudence (C) | 3.42 (.84) | 3.46 (.81) | 3.37 (.86) | .10 | 3.32 (.92) | 3.46 (.80) | 3.51 (.74) |
| Openness to Experience (O) | 3.39 (.69) | 3.49 (.67) | 3.30 (.69) | .29** | 3.38 (.66) | 3.46 (.69) | 3.34 (.73) |
| Aesthetic Appreciation (O) | 3.13 (1.01) | 3.31 (.99) | 2.95 (1.00) | .36*** | 3.11 (.99) | 3.22 (.99) | 3.05 (1.06) |
| Inquisitiveness (O) | 3.30 (.97) | 3.23 (.98) | 3.37 (.95) | -.15 | 3.22 (.94) | 3.38 (.98) | 3.31 (.99) |
| Creativity (O) | 3.78 (.84) | 3.95 (.75) | 3.62 (.88) | .41*** | 3.84 (.82) | 3.84 (.80) | 3.63 (.89) |
| Unconventionality (O) | 3.37 (.65) | 3.48 (.63) | 3.26 (.66) | .35*** | 3.35 (.65) | 3.40 (.65) | 3.35 (.67) |

*Note.* Asterisks indicate FDR-corrected significance levels for the F statistics (*p < 0.05; **p < 0.01; ***p < 0.001) reported in Table 6.

### 4.1. Differences in personality structure

Previous contributions showed evidence that the structure of personality of 10–14 years old adolescents is invariant across 6th, 7th and 8th grade, that means, approximately, across 11, 12 and 13 years (Sergi et al., 2020; Gnisci et al., 2023). Also, traits and facets seem to show the same internal consistency, providing evidence that levels of trait consolidation do not differ significantly between 6th, 7th and 8th grades (Mottola et al., in press). The results of this study align with previous contributions and show that the relations between the HEXACO traits remain substantially equivalent across the age groups examined. In other words, regarding RQ1, there was no evidence of differentiation in personality structure across the middle school years.

This pattern supports the idea that, in general, the number, contents and behaviors associated with the personality traits are already sufficiently formed around age ten-eleven and show flat or constant trend at least for three years, that is, the crucial period spanning from childhood to adolescence (Sergi et al., 2024). Before 10 years old, children use to describe themselves and others in evaluative terms (good versus bad), whereas older children describe themselves using differentiated personality traits (Ashton, 2023), including Openness to Experience and Honesty-Humility, traits less evident in early childhood according to observer reports. This structural invariance suggests that the six HEXACO factors provide a meaningful framework for understanding personality differences in early adolescence, although age-related differences in mean levels may still occur.

### 4.2. Differences in mean levels of personality traits and facets

In the following sections, results are discussed by predictor (grade, sex, and their interaction), while referring to specific traits and facets where relevant. Main effects are presented first, but particular attention is given to Grade × Sex interactions, which are discussed in a dedicated section.

#### 4.2.1. Grade-related differences

The results revealed consistent grade-related differences in several personality traits, particularly in self-report data. Specifically, lower levels of Honesty–Humility, Emotionality, Agreeableness, and Conscientiousness were observed in higher grades. At the facet level, these differences involved a broad set of components related to emotional reactivity (e.g., Fearfulness, Anxiety), interpersonal functioning (e.g., Forgiveness, Gentleness, Flexibility, Patience), and self-regulation (e.g., Diligence, Perfectionism, Prudence). In contrast, Unconventionality showed higher levels in older adolescents. Overall, more than half of the facets showed significant grade-related variation, indicating that facet-level analyses provide a more differentiated picture of personality differences across grades (Soto & Tackett, 2015; Luan et al., 2017).

It is important to note that these findings reflect differences between grade groups rather than intra-individual change, given the cross-sectional design of the study. Nonetheless, the observed patterns are consistent with previous literature reporting lower levels of traits related to compliance, emotional sensitivity, and behavioral regulation in older adolescents (Soto & Tackett, 2015; Steinberg, 2008), alongside higher

**Table 5**
ANCOVA of the effects of Sex and Grade on each Self Report HEXACO facets with Collection as covariate.

| | Collection | | | Sex | | | Grade | | | S*G | | | Polynomial Contrastsfor Grade |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | df | F | $\eta_p^2$ | df | F | $\eta_p^2$ | df | F | $\eta_p^2$ | df | F | $\eta_p^2$ | |
| Honesty-Humility | 1 | .15 | .00 | 1 | .69 | .00 | 2 | 22.77*** | .03 | 2 | .85 | .00 | L=-.185***, Q=.014 |
| Sincerity (H) | 1 | .26 | .00 | 1 | .12 | .00 | 2 | 12.69*** | .02 | 2 | 1.38 | .00 | L=-.160***, Q=.025 |
| Fairness (H) | 1 | .04 | .00 | 1 | 4.42 | .00 | 2 | 26.11*** | .03 | 2 | .35 | .00 | L=-.260***, Q=-.024 |
| Greed Avoidance (H) | 1 | .04 | .00 | 1 | .32 | .00 | 2 | 15.95*** | .02 | 2 | .64 | .00 | L=-.201***, Q=.017 |
| Modesty (H) | 1 | .63 | .00 | 1 | .07 | .00 | 2 | 7.61** | .01 | 2 | 3.52 | .00 | L=-.119***, Q=.037 |
| Emotionality | 1 | 1.19 | .00 | 1 | 95.91*** | .05 | 2 | 12.12*** | .01 | 2 | .84 | .00 | L=.131***, Q=-.029 |
| Fearfulness (E) | 1 | .01 | .00 | 1 | 34.09*** | .02 | 2 | 20.37*** | .02 | 2 | .12 | .00 | L=-.242***, Q=-.085* |
| Anxiety (E) | 1 | 4.97 | .00 | 1 | 77.67*** | .04 | 2 | 2.11 | .00 | 2 | .37 | .00 | - |
| Dependence (E) | 1 | .62 | .00 | 1 | 7.71* | .01 | 2 | 4.44* | .01 | 2 | .11 | .00 | L=-.113**, Q=-.015 |
| Sentimentality (E) | 1 | 15.98*** | .01 | 1 | 137.64*** | .08 | 2 | 4.06* | .01 | 2 | 3.68 | .00 | L=-.108**, Q=-.016 |
| Extraversion | 1 | 16.95*** | .01 | 1 | 51.79*** | .03 | 2 | 2.22 | .00 | 2 | .67 | .00 | - |
| Social Self-Esteem (X) | 1 | 11.01** | .01 | 1 | 47.15*** | .03 | 2 | 3.35 | .00 | 2 | .39 | .00 | - |
| Social Boldness (X) | 1 | 2.35 | .00 | 1 | 12.69*** | .01 | 2 | .51 | .00 | 2 | 2.93 | .00 | - |
| Sociability (X) | 1 | 5.45* | .00 | 1 | 55.01*** | .03 | 2 | 7.40** | .01 | 2 | .17 | .00 | L=-.133***, Q=-.053 |
| Liveliness (X) | 1 | 42.65*** | .02 | 1 | 37.05*** | .02 | 2 | 1.11 | .00 | 2 | 1.49 | .00 | - |
| Agreeableness | 1 | 27.77*** | .02 | 1 | 94.99*** | .05 | 2 | 17.55*** | .02 | 2 | 8.08*** | .01 | L=-.164***, Q=.038 |
| Forgivingness (A) | 1 | .00 | .00 | 1 | 97.14*** | .05 | 2 | 16.61*** | .02 | 2 | 2.24 | .00 | L=-.210***, Q=.038 |
| Gentleness (A) | 1 | 125.73*** | .07 | 1 | 13.50*** | .01 | 2 | 32.55*** | .04 | 2 | 4.70* | .01 | L=-.246***, Q=.064 |
| Flexibility (A) | 1 | 81.98*** | .05 | 1 | 74.45*** | .04 | 2 | 7.79*** | .01 | 2 | 6.22** | .01 | L=-.126***, Q=.007 |
| Patience (A) | 1 | .66 | .00 | 1 | 78.28*** | .04 | 2 | 2.42 | .00 | 2 | 9.87*** | .01 | - |
| Conscientiousness | 1 | .08 | .00 | 1 | 3.59 | .00 | 2 | 4.11* | .01 | 2 | .03 | .00 | L=-.093**, Q=.002 |
| Organization (C) | 1 | .03 | .00 | 1 | .54 | .00 | 2 | .01 | .00 | 2 | .31 | .00 | - |
| Diligence (C) | 1 | 7.54* | .00 | 1 | 8.21* | .01 | 2 | 3.24 | .00 | 2 | .47 | .00 | - |
| Perfectionism (C) | 1 | 14.88*** | .01 | 1 | 21.94*** | .01 | 2 | 8.35*** | .01 | 2 | 2.05 | .00 | L=-.165***, Q=.005 |
| Prudence (C) | 1 | 5.29* | .00 | 1 | 4.54 | .00 | 2 | 5.16* | .01 | 2 | 1.89 | .00 | L=-.122***, Q=-.009 |
| Openness to Experience | 1 | .63 | .00 | 1 | 19.45*** | .01 | 2 | .23 | .00 | 2 | 1.79 | .00 | - |
| Aesthetic Appreciation (O) | 1 | 2.90 | .00 | 1 | 25.01*** | .01 | 2 | 3.51 | .00 | 2 | .38 | .00 | - |
| Inquisitiveness (O) | 1 | .03 | .00 | 1 | 2.83 | .00 | 2 | 1.06 | .00 | 2 | .69 | .00 | - |
| Creativity (O) | 1 | .03 | .00 | 1 | 17.47*** | .01 | 2 | 1.37 | .00 | 2 | 1.98 | .00 | - |
| Unconventionality (O) | 1 | .01 | .00 | 1 | 49.12*** | .03 | 2 | 17.82*** | .02 | 2 | 4.81* | .01 | L=.170***, Q=.021 |

*Note 1.* df values refer to the numerator degrees of freedom; the denominator degrees of freedom (dfE) were constant across analyses (dfE = 1700).
*Note 2.* *FDR corrected $p < 0.05$; **FDR corrected $p < 0.01$; ***FDR corrected $p < 0.001$.

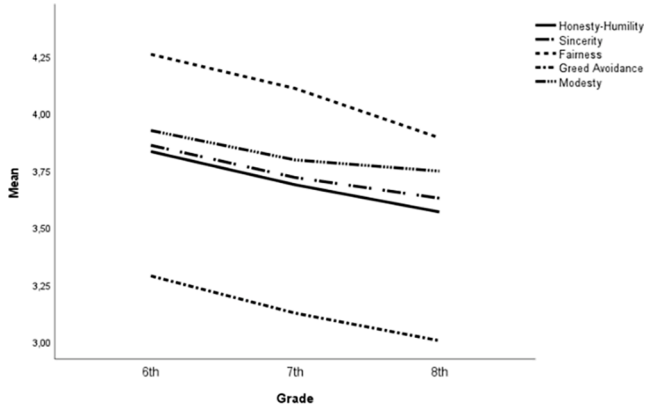


**Fig. 1.** Mean scores across grades for the self-report Honesty–Humility trait and its significant facets.

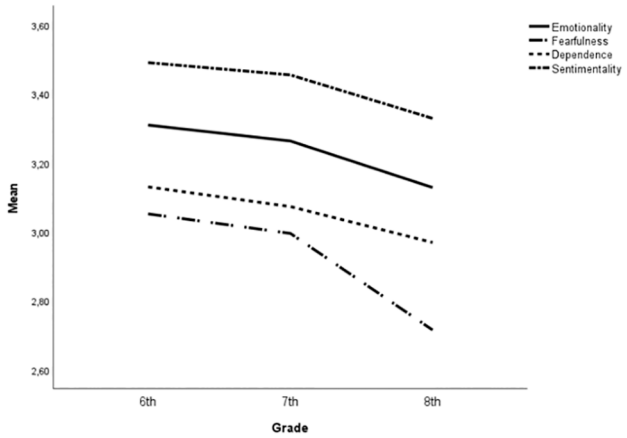


**Fig. 2.** Mean scores across grades for the self-report Emotionality trait and three of its significant facets.

levels of autonomy-related characteristics (Steinberg, 2008; Branje et al., 2007). The observed decline in Honesty–Humility from late childhood to early adolescence may reflect a transition from protected, family-centered environments to broader and more complex social ecologies. While in childhood cooperative behavior is often expressed within family relationships (Hamilton, 1964), the increasing engagement with peers requires cooperation and trust to be negotiated in more competitive and less predictable settings. These emerging social dynamics may lead to an adaptive recalibration of the trait, as adolescents adjust their prosocial tendencies to navigate new social

**Table 6**
ANOVA of the effects of Sex and Grade on each Parent-report HEXACO facet.

| | Sex | | | Grade | | | S*G | | | Polynomial Contrastsfor Grade |
|---|---|---|---|---|---|---|---|---|---|---|
| | df | F | $\eta_p^2$ | df | F | $\eta_p^2$ | df | F | $\eta_p^2$ | |
| Honesty-Humility | 1 | .14 | .00 | 2 | 1.25 | .01 | 2 | .01 | .00 | - |
| Sincerity (H) | 1 | 1.12 | .00 | 2 | .06 | .00 | 2 | .70 | .00 | - |
| Fairness (H) | 1 | 1.52 | .00 | 2 | .12 | .00 | 2 | .45 | .00 | - |
| Greed Avoidance (H) | 1 | .00 | .00 | 2 | 2.22 | .01 | 2 | .30 | .00 | - |
| Modesty (H) | 1 | .45 | .00 | 2 | 1.94 | .01 | 2 | .39 | .00 | - |
| Emotionality | 1 | 4.13 | .01 | 2 | 6.66** | .03 | 2 | .33 | .00 | L=-.177***, Q=.007 |
| Fearfulness (E) | 1 | 1.08 | .00 | 2 | 5.11* | .03 | 2 | 1.84 | .01 | L=-.223**, Q=.010 |
| Anxiety (E) | 1 | 2.67 | .01 | 2 | 3.80 | .02 | 2 | .82 | .00 | - |
| Dependence (E) | 1 | .21 | .00 | 2 | 4.42 | .02 | 2 | 2.19 | .01 | - |
| Sentimentality (E) | 1 | 8.33* | .02 | 2 | 1.77 | .01 | 2 | .75 | .00 | - |
| Extraversion | 1 | 2.99 | .01 | 2 | .01 | .00 | 2 | .88 | .00 | - |
| Social Self-Esteem (X) | 1 | 2.02 | .01 | 2 | .70 | .00 | 2 | 1.00 | .01 | - |
| Social Boldness (X) | 1 | 2.14 | .01 | 2 | .58 | .00 | 2 | 3.70 | .02 | - |
| Sociability (X) | 1 | 3.13 | .01 | 2 | 1.97 | .01 | 2 | .35 | .00 | - |
| Liveliness (X) | 1 | 1.23 | .00 | 2 | .13 | .00 | 2 | .14 | .00 | - |
| Agreeableness | 1 | 17.19*** | .04 | 2 | 3.54 | .02 | 2 | 1.64 | .01 | - |
| Forgivingness (A) | 1 | 21.96*** | .05 | 2 | 7.64** | .04 | 2 | 1.71 | .01 | L=-.280***, Q=.027 |
| Gentleness (A) | 1 | 2.03 | .01 | 2 | 1.87 | .01 | 2 | .24 | .00 | - |
| Flexibility (A) | 1 | 10.44** | .03 | 2 | 4.04 | .02 | 2 | 3.73 | .02 | - |
| Patience (A) | 1 | 13.38*** | .03 | 2 | .21 | .00 | 2 | 2.19 | .01 | - |
| Conscientiousness | 1 | 7.72* | .02 | 2 | .12 | .00 | 2 | 3.71 | .02 | - |
| Organization (C) | 1 | 1.10 | .00 | 2 | .26 | .00 | 2 | .31 | .00 | - |
| Diligence (C) | 1 | 20.09*** | .05 | 2 | .59 | .00 | 2 | 7.62** | .04 | - |
| Perfectionism (C) | 1 | 23.46*** | .06 | 2 | .20 | .00 | 2 | 5.91* | .03 | - |
| Prudence (C) | 1 | 1.35 | .00 | 2 | 1.75 | .01 | 2 | .85 | .00 | - |
| Openness to Experience | 1 | 11.26** | .03 | 2 | 1.12 | .01 | 2 | 4.44* | .02 | - |
| Aesthetic Appreciation (O) | 1 | 17.07*** | .04 | 2 | .94 | .01 | 2 | 4.36 | .02 | - |
| Inquisitiveness (O) | 1 | 1.13 | .00 | 2 | 1.18 | .01 | 2 | 3.13 | .02 | - |
| Creativity (O) | 1 | 19.89*** | .05 | 2 | 2.89 | .01 | 2 | 2.25 | .01 | - |
| Unconventionality (O) | 1 | 13.76*** | .03 | 2 | .22 | .00 | 2 | 1.36 | .01 | - |

*Note 1.* df values refer to the numerator degrees of freedom; the denominator degrees of freedom (dfE) were constant across analyses (dfE = 397).
*Note 2.* *FDR corrected $p < 0.05$; **FDR corrected $p < 0.01$; ***FDR corrected $p < 0.001$.

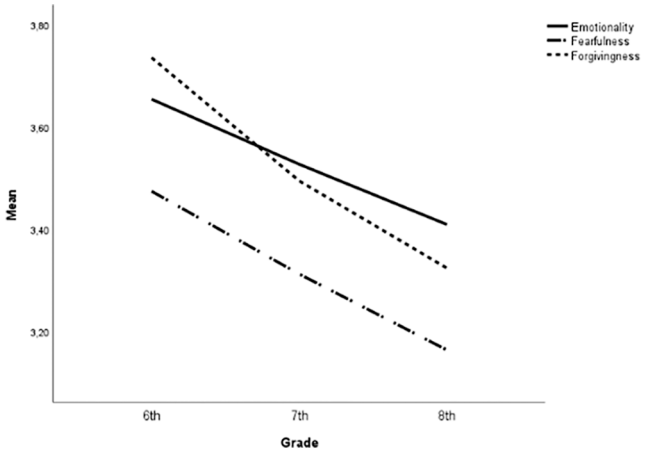


**Fig. 3.** Mean scores across grades for the observer Emotionality trait and the Fearfulness (E) and Forgivingness (A) significant facets.

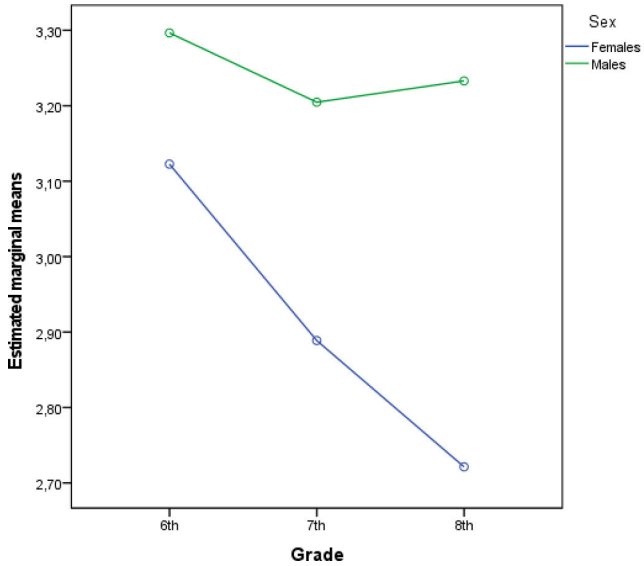


**Fig. 4.** Means scores for the significant Sex × Grade interaction effect on self-report Agreeableness.

hierarchies. Similarly, the lower levels of Emotionality likely reflect a normative trajectory toward more advanced emotion regulation and psychological independence (Allik et al., 2004). These findings align with the disruption hypothesis, which predicts temporary declines in traits such as Conscientiousness, Agreeableness, and Openness during early adolescence (De Fruyt et al., 2006; Denissen et al., 2013; Soto & Tackett, 2015). Rather than an abrupt dip, our results indicate a gradual and consistent downward trend, suggesting that personality

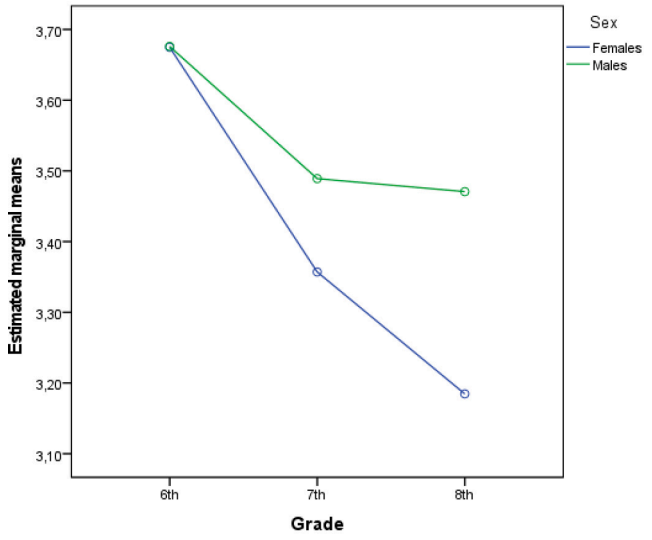


**Fig. 5.** Means scores for the significant Sex × Grade interaction effect on self-report Gentleness facet (Agreeableness).

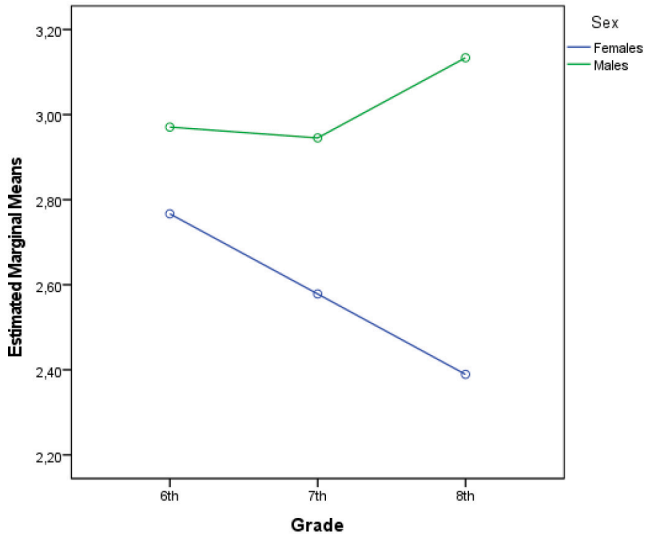


**Fig. 7.** Means scores for the significant Sex × Grade interaction effect on self-report Patience facet (Agreeableness).

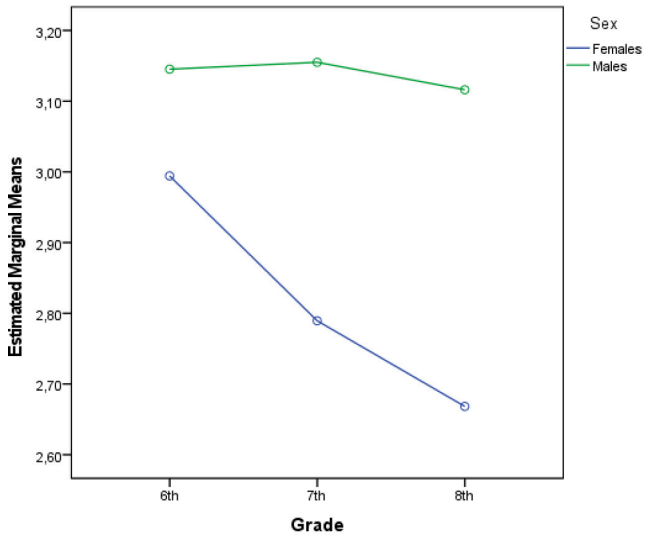


**Fig. 6.** Means scores for the significant Sex × Grade interaction effect on self-report Flexibility facet (Agreeableness).

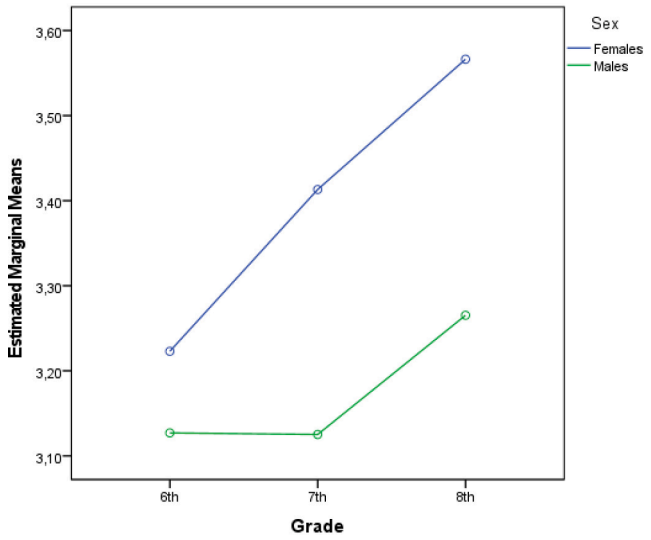


**Fig. 8.** Means scores for the significant Sex × Grade interaction effect on self-report Unconventionality facet (Openness to Experience).

development in early adolescence may follow more linear and less reversible patterns than previously assumed, consistent with recent longitudinal evidence (Jones et al., 2022; Brazil et al., 2025).

Parent-report data showed fewer grade-related differences. At the trait level, lower levels in higher grades were observed only for Emotionality. At the facet level, only Fearfulness and Forgiveness showed similar decreasing patterns. Thus, while some convergence between informants was observed, particularly for Emotionality-related aspects, grade-related differences were more limited in parent-reports than in self-reports (De Los Reyes & Kazdin, 2005; Costa et al., 2019).

#### 4.2.2. *Sex differences*

Consistent sex differences emerged across both self-report and parent-report data, although they were generally more pronounced in self-reports. Girls reported higher levels of Emotionality and Openness to Experience, whereas boys reported higher levels of Extraversion and Agreeableness. Higher Emotionality and lower Extraversion in adolescent girls are consistent with epidemiological evidence indicating their higher likelihood of being diagnosed with anxiety and depression during this period (Wang et al., 2024; Demkowicz et al., 2025). These differences were also reflected at the facet level, with girls scoring higher in facets related to emotional sensitivity and openness, and boys scoring higher in facets related to social engagement and certain interpersonal tendencies. This earlier maturation in girls' personality profiles likely reflects accelerated biological development, a point further elaborated in the following section regarding grade-related changes.

Parent-report data showed a partially convergent pattern. Girls were rated higher in Conscientiousness and Openness to Experience, whereas boys were rated higher in Agreeableness. At the facet level, girls were rated higher in Diligence, Perfectionism, and Openness-related facets, whereas boys were rated higher in Forgiveness, Flexibility, and Patience.

#### 4.2.3. *Grade × Sex interactions*

An important finding of the present study concerns the presence of some significant Grade × Sex interactions, indicating that grade-related differences are sometimes not uniform across sexes (Steinberg, 2008; Branje et al., 2007).

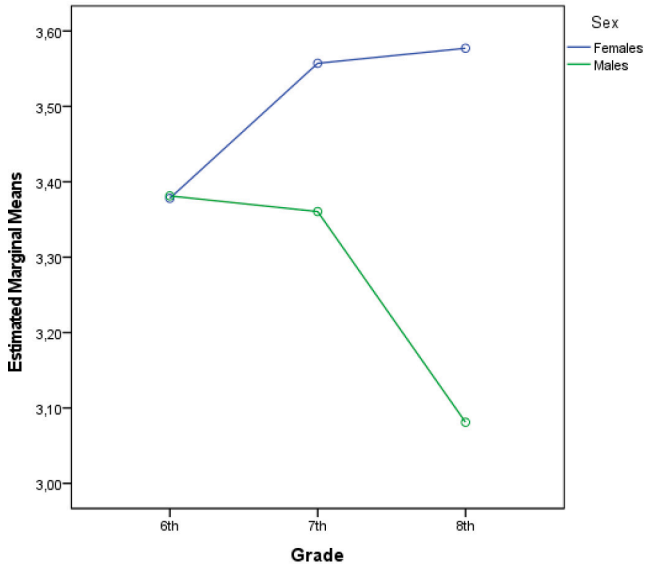


**Fig. 9.** Means scores for the significant Sex × Grade interaction effect on parent-report Openness to Experience.

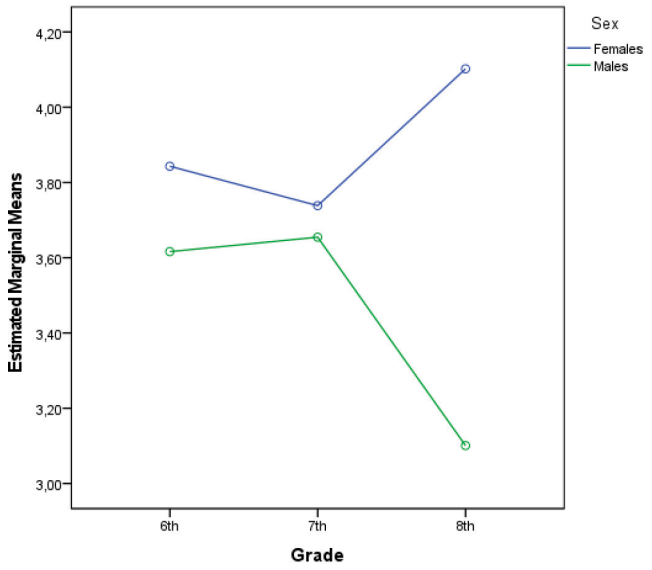


**Fig. 10.** Means scores for the significant Sex × Grade interaction effect on parent-report Diligence (Conscientiousness).

In self-report data, Agreeableness showed a clear decline across grades among girls, whereas boys showed relatively stable levels. At the facet level, several components of Agreeableness, such as Flexibility and Patience, decreased only among girls, while Gentleness declined in both sexes but more markedly in girls. This gender-specific pattern in Agreeableness, where girls show a more pronounced decline in Gentleness, Flexibility, and Patience, aligns with the perspective that girls may experience more intense intra-sexual competition during early adolescence (Benenson & Markovits, 2014). This competition often involves a more critical evaluation of female peers, which may underlie the observed differences in cooperation and the faster reduction of these 'mature' tendencies compared to boys. In addition, Unconventionality increased across grades in both sexes, although this increase appeared earlier in girls than in boys. The earlier increase in Unconventionality among girls might be explained by the faster maturation of the cerebral cortex in females during early adolescence, which typically stays ahead of boys until ages 14–15 (Colom & Lynn, 2004). This accelerated

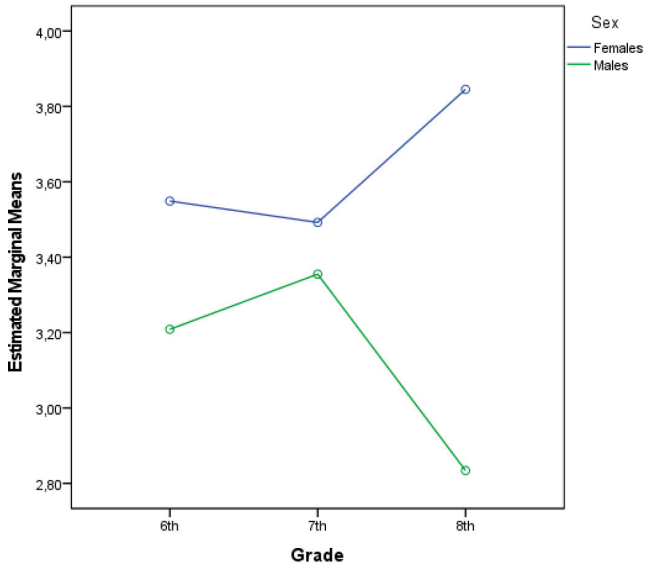


**Fig. 11.** Means scores for the significant Sex × Grade interaction effect on parent-report Perfectionism facet (Conscientiousness).

biological development may provide a more 'adult-like' personality profile in girls earlier than in their male peers (Silberman & Snarey, 1993; Porteous, 1985).

Regarding parent-report data, the interaction effect found for Openness to Experience suggests that boys' observed decrease across grades may reflect a gradual narrowing of curiosity, novelty seeking, or engagement with unconventional interests during early adolescence, whereas girls' levels remained comparatively stable. Because parent reports are more likely to capture externally visible preferences and behaviors, this pattern may indicate that changes in Openness become more evident to parents in boys than in girls as adolescents move through middle school (Branje et al., 2007; De Bolle et al., 2015; Luan et al., 2017). Beyond these broad traits, interaction effects were more nuanced, emerging specifically at the level of Conscientiousness facets. In particular, Diligence and Perfectionism showed a clearer decline across grades in boys, whereas girls showed relatively stable levels. Interestingly, the downward trend in Conscientiousness facets observed by parents primarily in boys may reflect increased impulsivity and reduced responsibility, which are often linked to the rapid psychological and biological changes of early adolescence (Soto & Tackett, 2015; Steinberg & Morris, 2001). The fact that parents notice this decline more clearly in boys suggests that girls might maintain a higher level of achievement-oriented behavior—such as being more detailed and precise in tasks—due to higher societal or self-critical pressures (Frost et al., 1990; Harter, 2012).

Taken together, these findings indicate that grade-related differences in personality are sometimes moderated by sex and that, therefore, controlling for sex should not be neglected in research that wants to study change in adolescence. Focusing on these sex-specific patterns allows to understand how girls and boys may adjust their self-regulatory traits to navigate the evolving demands of their social environment (Hunter & Youniss, 1982; Rice & Mulkeen, 1995). Notably, interaction effects were more pronounced in self-report data, whereas parent-reports showed fewer and more circumscribed interactions.

#### *4.2.4. Integration across traits, facets, and informants*

Considering traits, facets, and informants jointly, the results point to a coherent pattern in which grade-related differences are more clearly captured in self-reports and are more extensively observed at the facet level. Facet-level analyses revealed patterns that were, in general, coherent with the ones of the traits but sometimes not always evident,

underscoring the importance of examining lower-order components to fully understand personality differences. Indeed, analyzing facets is not merely a refinement but a necessity, as it prevents broader trait scores from obscuring significant patterns that might otherwise remain hidden. For instance, while Conscientiousness as a broad trait did not always show significant sex differences in self-reports, the specific focus on Diligence and Perfectionism revealed a consistent female advantage across both informants (Soto & Tackett, 2015).

At the same time, the comparison between self- and parent-report data indicates partial convergence, with some traits and facets showing similar patterns across informants and others differing. Specifically, self- and observer perceptions substantially converged for domains related to interpersonal cooperation (Agreeableness) and self-discipline (Conscientiousness). As noted by Ashton and Lee (2007), parents and adolescents tend to reach a higher consensus on visible behavioral traits that directly impact the family environment and academic performance. The only notable discrepancy in these domains concerned Gentleness, which boys rated higher for themselves than their parents did, suggesting that some aspects of this trait may be more readily captured by self-reports than by parent ratings, possibly also reflecting differences in perspective or social desirability bias.. The overall lower number of sex differences reported by parents, particularly in Emotionality and Extraversion, suggests that observers might apply a more 'gender-neutral' lens or have a different reference group compared to adolescents, who are more sensitive to peer-group norms (Lee & Ashton, 2020). However, the consistent overlap found in the Sentimentality facet highlights this as a particularly salient marker of personality expression that is easily recognized by both informants. In conclusion, while self-reports and parent-reports provide complementary perspectives, they reach a significant consensus on the core interpersonal and self-regulatory changes that characterize early adolescence.

### 4.3. Limitations

Some limitations of this study should be acknowledged. First, although the samples were large, they are not representative, as data were collected in a single Southern region of Italy. Second, the cross-sectional design, while advantageous for obtaining a large sample within a short time frame and allowing comparisons across age groups, entails the well-known limitations of cross-sectional approaches compared to longitudinal ones. In particular, it does not prevent the so-called cohort effect. Nonetheless, in the present study, the one-year interval between cohorts likely reduced the possibility that generational differences acted as confounding variables. Future studies employing longitudinal designs would therefore be valuable to examine whether the observed grade-related patterns reflect underlying developmental processes.

Finally, a third limitation concerns the unequal sample sizes between the self-report and parent-report data, with the latter being smaller. Future research should aim to collect larger and fully matched parents' samples to ensure greater comparability across sources. Despite these limitations, it is worth emphasizing that the use of both self- and parent-report methods, each offering unique perspectives, provides a richer and more nuanced understanding of personality change during adolescence.

## 5. Conclusion

The present study provides evidence of systematic grade-related and sex differences in personality traits and facets within the HEXACO framework during early adolescence. These differences were more pronounced in self-reports than in parent-reports and were further qualified by significant Grade × Sex interactions, highlighting the importance of considering both informant and interaction effects.

Overall, the findings underscore the value of examining personality at both the trait and facet levels and contribute to a more nuanced understanding of how individual differences vary across early adolescence.

## 6. Open practices

The study in this article earned Open Data badge for transparent practices. Data for this study are available at: https://osf.io/natqc/overview.

## CRediT authorship contribution statement

**Francesca Mottola:** Writing – original draft, Visualization, Supervision, Software, Methodology, Investigation, Formal analysis, Data curation. **Augusto Gnisci:** Writing – original draft, Resources, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Marco Perugini:** Supervision, Methodology, Investigation, Formal analysis. **Vincenzo Paolo Senese:** Validation, Resources, Project administration, Methodology, Funding acquisition, Data curation, Conceptualization. **Ida Sergi:** Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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This study was not pre-registered.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jrp.2026.104728.

## Data availability

The data for this study are available through the link reported in the Open Practices section.

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