Differences in Loneliness Experiences Among High-Ability Students: Individual and Social Context Predictors

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Loneliness is commonly defined as the negative emotional feeling that arises when one's desired quality of social experiences is not met (Peplau & Perlman, 1982). Frequent experiences of loneliness have been related to various indicators of poor mental health among adolescents, including anxiety, depressive symptoms, and medical issues (Asher & Paquette, 2003; Lodder et al., 2017; Vanhalst et al., 2014), as well as maladjustment indicators such as substance use, alcoholism, and school dropout (Asher & Paquette, 2003; Woodhouse et al., 2012; Young, 1981). There is variation in the degree of loneliness experiences (Vanhalst et al., 2013), with some adolescents experiencing frequent feelings of loneliness that lead to poor mental health outcomes, and some experiencing none. Understanding the factors that make adolescents susceptible to loneliness is crucial for identifying lonely students and understanding which factors can be addressed to help them.

This study specifically focuses on early secondary school students, as early adolescence is a developmental period marked by significant personal changes, including those in social relationships (Sebastian et al., 2008). During this developmental period, adolescents increasingly value relationships with peers. Social relationships play a key role in adolescents' development, shaping their self-perceptions and identity through the lens of peer perceptions and comparisons (Sebastian et al., 2008). Because of the primacy of social relationships, being accepted in the peer group and making friends are considered key developmental challenges in adolescence (Steinberg & Morris, 2001). This desire for peer relationships, however, is juxtaposed by the changing school environment in the transition from primary to secondary school. This transition is characterized by changes in classmates, a larger peer group, and decentralized instructional methods that require students to change teachers throughout the day. According to stage-environment fit theory (Eccles et al., 1993), the mismatch between adolescents' needs and what their environments offer can lead

to negative psychological development. In the context of adolescents seeking peer relationships, the change in the school environment during early secondary school may result in decreased satisfaction with the quality of their social relationships, potentially leading to feelings of loneliness.

Loneliness Among High-Ability Students

A group that has received limited attention in loneliness research are the cognitively high-ability students. In this manuscript the term "high-ability" will be used to refer to students with high cognitive capacities while the term "gifted" will be reserved for students who have been formally labeled as gifted, for instance by a licensed psychologist with the help of a standardized intelligence test. Despite common portrayals of highly intelligent students as socially isolated (Baudson, 2016; Vialle, 2007), empirical evidence suggests considerable variation in their peer experiences (Neihart & Yeo, 2018). The present study combines theoretical insights from developmental psychology, loneliness research, and giftedness literature to explore variation in the development of loneliness within the high-ability population. It focuses specifically on students who are highly able in the cognitive domain, a central aspect in many giftedness models (i.e., Gagné, 2009; Heller et al., 2005; Subotnik, 2011) and is arguably the type of giftedness that is most relevant to the school environment. Following Gagné's model (2009), this study focuses on students whose cognitive abilities rank among the top 10% of their age peers.

Contemporary perspectives regard giftedness as potential that may be transformed into performance through a developmental process influenced by personal and environmental factors (i.e., Gagné, 2009; Subotnik, 2011). In these models, positive social interactions and peer relationships are considered environmental factors that can contribute to talent development among high-ability students (Gagné, 2009). However, several studies suggest that high-ability students are often perceived as less socially competent (Baudson & Preckel, 2016; Händel et al., 2013; Matheis et al., 2020; Weyns et al., 2021), increasing their risk of loneliness.

Vignette studies have shown that teachers generally expect high-ability students to be less socially competent than average-ability peers (Baudson & Preckel, 2016; Matheis et al., 2020; Weyns et al., 2021). Moreover, a study among adolescents showed that students excelling in mathematics, science or languages were perceived by their peers as less socially competent compared to those who excelled in sports subjects (Händel et al., 2013). Empirical evidence on high-ability students' social competence, however, is mixed (Plucker & Callahan, 2014). Some studies suggest that they exhibit equal or even higher social competence than their peers (Peairs et al., 2019; Verschueren et al., 2019). Conversely, other studies suggest that this might not be universally applicable to all high-ability students (Neihart, 1999; Neihart & Yeo, 2018; Peairs et al., 2019). Neihart (1999) concluded based on empirical findings that social belonging can vary depending on the type of high ability (i.e., verbal versus math), educational fit (or lack thereof), and personal characteristics. Verschueren et al. (2019) found that high-ability students feel better accepted in classes with higher average cognitive abilities.

To date, research on the social experiences of high-ability students has primarily focused on whether their high ability serves as a risk factor or a protective factor in their social-emotional development (Guignard et al., 2021; Košir et al., 2016; Peairs et al., 2019). Some scholars argue that high-ability students generally have a better understanding of themselves and the world around them, facilitating peer connections (Košir et al., 2016; Peairs et al., 2019). Others suggest that they may be more sensitive and anxious, facing more peer-related challenges (Guignard et al., 2021; Neihart, 1999). In both strands of aforementioned research, the goal is often to uncover differences between high-ability students and their typical peers. However, high-ability students form a heterogenous group of students with diverse personalities, abilities, and backgrounds (Reis & Renzulli, 2009). Consequently, the pivotal question may not be whether high cognitive ability is inherently a developmental risk factor, but rather under which circumstances high-ability students are at risk for developmental problems. In this study, our objective was to highlight the range of

social experiences among high-ability students by identifying risk factors of loneliness in this group.

Individual Risk Factors of Loneliness for High-Ability Students

This section explores how different individual factors such as cognitive ability level, feelings of being different, personality traits, and gender might contribute to variations in loneliness among high-ability students. A first possible source of variation among high-ability students is their level of ability. Following the Differentiated Model of Giftedness and Talent proposed by Gagné (DMGT; 2009), students with cognitive abilities in the top 10% of their age group (i.e., an IQ score above 120), are considered high-ability. Intelligence, a relatively stable trait over the lifespan (Larsen et al., 2008), varies even within this selective group.

According to the person environment fit theory, mismatches between a student's characteristics and their environment's resources can negatively impact their development (Mueller & Winsor, 2018). Higher intelligence increases the likelihood of mismatch with social and educational environment, potentially leading to isolation and loneliness (Mueller & Winsor, 2018). Exceptionally high-ability students are prone to asynchronous development (Mueller & Winsor, 2018), where cognitive development outpaces social or emotional development (Rinn & Majority, 2018). This asynchrony could theoretically lead to social and emotional maladjustment (Mueller & Winsor, 2018; Rinn & Majority, 2018). Despite these theoretical concerns, few studies have empirically linked cognitive ability levels to social and emotional adjustment in high-ability students.

The few empirical studies that have been undertaken affirm the person-environment fit theory, indicating that extremely high-ability students face more social difficulties than moderately high-ability students. For instance, in one study 13-year-olds with extreme cognitive high ability perceived themselves as less socially adept, less popular, and more inhibited than their moderately high-ability peers (Dauber & Benbow, 1990). Another study found that higher intellectual ability

correlated with negative perceptions of peer acceptance and the ability to maintain close friendships in a summer program for high-ability students (Chan, 2002).

A second risk factor for loneliness is feeling different from peers (Young, 1981). Giftedness is implicitly associated with excellence, rarity, and specialness, which are qualities that inherently set gifted students apart from their peers (Heller et al., 2005) and may lead to peer stigmatization (Košir et al., 2016). Although some labeled gifted students perceive their label as primarily positive, many acknowledge strong negative social implications (Kerr et al., 1988), which increase with age (Feldhusen & Dai, 1997). Guignard and colleagues (2021) showed that students who were labeled as gifted reported lower levels of peer connectedness compared to their nonlabelled peers. Labeling is linked with stereotyping, where others assume characteristics of a labeled individual that correspond with preconceived notions of the label. Labeling is also connected to self-stereotyping, where individuals adopt the preconceived characteristics of their own label. Additionally, labeling is associated with self-fulfilling prophecy, by which the behaviors of individuals with a label may be influenced by the expected characteristics of the label (Link & Phelan, 2001). In the case of the gifted label, individuals characterized as gifted may feel more isolated from peers because of the connotation of being separate from peers inherent in the label, and they may also self-isolate from peers because of these connotations.

A third factor that could explain variation in experiences among high-ability students is personality differences. Characterological theories of loneliness describe how personality traits affect students' social relationships by altering social attractiveness, interactional behavior, and responses to changes in relationships (Peplau & Perlman, 1982). Typically, five major personality dimensions are identified: extraversion, agreeableness, conscientiousness, neuroticism, and openness (McCrae & Costa, 2008). These dimensions are generally considered to be relatively stable traits over time (Cobb-Clark & Schumer, 2012). Among these dimensions, neuroticism (i.e., the tendency to experience negative emotions and the ability to deal with these emotions) and a

lack of extraversion (i.e., the tendency to prefer companionship and social stimulation) and agreeableness (i.e., the tendency to be cooperative and avoid disagreement with others during conflict) have been most often linked to loneliness (Buecker et al., 2020).

There are no discernable average differences in these personality dimensions between high-ability and typical students (Ogurlu & Özbey, 2021). However, it remains unexplored whether they serve as risk factors for loneliness among high-ability students, as in the general population. It is interesting to explore whether high-ability students with neurotic, disagreeable, or introverted tendencies face increased loneliness, or if high cognitive ability mitigates these associations.

A fourth individual factor that we explored as a risk factor for loneliness among high-ability students was gender. While Maes et al. (2019) found no average difference in loneliness among males and females, the dynamics may differ for high-ability students. High-ability girls may be more socialized to value acceptance (Kerr & McKay, 2014; Kerr & Multon, 2015), which may make them more susceptible to loneliness if they are not accepted. As adolescence progresses, high-ability girls' focus shifts from performance to social relationships, which can be a challenging transition (Kerr et al., 1988). Whereas high-ability boys are on average more popular than average-ability boys and girls, high-ability girls appear to be the least popular of these four groups of students (Luftig & Nichols, 1990). High-ability girls seem to grasp early on that their cognitive capabilities may hinder their social experiences (Reis, 2002). Consequently, high-ability girls may not only be more susceptible to loneliness, but it is also possible that the impact of other social factors play a more significant role in shaping their experience of loneliness compared to boys.

Social Context Risk Factors of Loneliness for High-Ability Students

Research on loneliness often examines social context elements alongside individual risk factors (Vanhalst et al., 2014). This section explores peer acceptance and rejection, peer victimization, and friendships as potential contributors to loneliness among high-ability students. Peer acceptance and peer rejection, collectively known as "social preference," represent the extent

to which a student is liked or disliked by their peers (Newcomb & Bukowski, 1993). In the general student population, both factors have been connected to loneliness in adolescents (Rubin et al., 2006; Vanhalst et al., 2014; Woodhouse et al., 2012; Zhang et al., 2014). High-ability students generally experience similar levels of social preference as their average-ability peers and are often more accepted (Peairs et al., 2019; Verschueren et al., 2019). There is no evidence suggesting that peer acceptance or rejection impacts loneliness differently for high-ability students compared to their peers.

Second, peer victimization is a well-known predictor of loneliness in adolescence (Vanhalst et al., 2014). Peer victimization refers to being the target of repeated and intentional aggressive behavior by more powerful peers (Olweus, 1993). Victimized youth often avoid social interaction, increasing loneliness (Storch & Masia-Warner, 2004). High-ability students report victimization rates similar to their peers (Peairs et al., 2019; Ryoo et al., 2017), often attributing it to their cognitive abilities (Peterson & Ray, 2006). Existing studies on this topic have primarily focused on differences between high- and average ability students. No studies have explored differences within the high-ability population based on victimization experiences.

Third, friendships, defined as a reciprocal relationship between two people characterized by intimacy and affection (Bukowski & Hoza, 1989), provide insight into peer experiences (Rubin et al., 2006). Students tend to choose friends with similar gender, ethnicity, interests, and academic characteristics (Gifford-Smith & Brownell, 2003). High-ability students may find it challenging to establish friendships due to having fewer peers with similar cognitive abilities (Coleman et al., 2015). The often nominate fewer friends (Verschuren et al., 2019) and rate their ability to maintain close friendships lower that their peers (Chan, 2002). Educational context influences this dynamic, with gifted students in pull-out programs feelings less lonely than those in self-contained gifted classrooms (Cash & Lin, 2022).

Social preference, peer victimization, and friendship each capture distinct aspects of adolescents' peer experiences and are conceptually and empirically distinct (Rubin et al., 2015; Vanhalst et al., 2014). Social preference represents the degree to which an individual is liked or disliked by the members of a specific group, often the class group. Peer victimization entails a smaller subgroup of bullies, victims, and bystanders, capturing the power dynamics to which an individual is subjected. Lastly, friendship refers to a mutual relationship between two individuals that is expected to provide these individuals with intimacy and affection (Bukowski & Hoza, 1989).

Loneliness in Adolescence

Adolescence is a stage of development characterized by a heightened significance and evolution of social experiences. Young people are becoming less dependent on their parents, and peers are assuming an increasingly central role in their social world. When interactions with peers encounter difficulties, there is a heightened likelihood of experiencing feelings of loneliness (Teppers et al., 2013). For high-ability students, this phase can pose additional social challenges. While academic success in primary school brings social prestige, its value tends to diminish during the secondary school years (Lee et al., 2012). Consequently, early adolescence seems to be a pivotal juncture in the social development of high-ability students, representing a potential key moment for the emergence of feelings of loneliness.

This Study

In this study, we aimed to integrate insights from loneliness and giftedness research to explore the development of loneliness among early adolescents with high cognitive ability. This developmental stage is of particular interest for high-ability students because peers start to take up a bigger role in students' social context (Eccles et al., 1993), while peer norms related to achievement become more negative (Lee et al., 2012). We addressed four research questions:

First, we investigated whether variations in loneliness among high-ability students could be attributed to disparities in cognitive ability level or to being formally labeled as gifted. As intelligence levels increase, the cognitive gap between students and their peers widens, potentially hindering social connections (Mueller & Winsor, 2018; Rinn & Majority, 2018). Consequently, we expected that higher levels of cognitive ability would be associated with a greater risk of loneliness (H1a). Being formally labeled as gifted may convey an explicit message of difference from peers (Košir et al., 2016), which we expected would lead to difficulties in peer relationships and thus to higher levels of loneliness (H1b).

Second, we examined the role of personality traits in predicting loneliness among high-ability students. While no research has specifically addressed this link within high-ability populations, studies in the general population suggest that introversion, neuroticism, and antagonism (low agreeableness) are linked to higher loneliness (Buecker et al., 2020). We expected similar trends in high-ability students, with higher levels of introversion (H2a), neuroticism (H2b), and antagonism (H2c) predicting higher levels of loneliness.

Third, we explored whether aspects of the social context--peer acceptance, peer rejection, victimization, and friendship quantity)--were associated with loneliness among high-ability students. Limited research has examined how these social factors influence loneliness in this group. Based on findings from the general population (Storch & Masia-Warner, 2004; Vanhalst et al., 2014; Vanhalst et al., 2014; Woodhouse et al., 2012; Zhang et al., 2014), we hypothesized that lower peer acceptance (H3a), higher peer rejection (H3b), more victimization (H3c), and fewer reciprocated friendships (H3d) would predict increased loneliness among high-ability students.

Finally, we investigated gender differences in loneliness experiences among high-ability students. We examined both the level of loneliness and in the impact of social context characteristics on loneliness. Although research on this topic is limited, existing literature suggests high-ability girls face more social challenges than their male counterparts (Luftig & Nichols, 1990;

Reis, 2002). Consequently, we hypothesized that high-ability girls would experience, on average, more loneliness than high-ability boys (H4a). Additionally, since social preference is more important for high-ability girls (Kerr & McKay, 2014; Kerr & Multon, 2015), we expected the effects of peer acceptance and rejection on loneliness to be more pronounced for girls (H4b). Due to the scarcity of prior research on this matter, differences in the effects of other social context characteristics between boys and girls were investigated in an exploratory manner, without forming specific hypotheses.

Method

Participants

The study took place in Flanders, the Dutch-speaking part of Belgium. In Flanders, schools do not systematically screen for giftedness. Attention to tailoring education to the needs of high-ability students, for instance through pull-out programming, has gained traction in the past few years, it is not yet uniformly widespread in Flemish schools. Generally speaking, in Flanders giftedness has been perceived as associated with behavioral and emotional problems (Weyns et al., 2021), and has been most likely to be investigated and diagnosed among students experiencing mental health or school-related concerns (Prodia, 2019). Because of these associations, most people might not view giftedness as socially desirable.

The data used in this study stemmed from the [anonymized for peer review]-study, a large-scale longitudinal study of 3,409 students (M_{age} = 12.4 years, 50.3% males) from 166 classes in 27 secondary schools. The TALENT data comprise four waves of data collected during the 7th and 8th grade, the first two years of secondary school. All of the first year classes from participating schools were included in the study, and all students from the classes, as well as their parents and teachers, were asked to participate. The study was approved by the ethical committee of the host institution of the first authors. For a full list of all constructs assessed among the students per measurement wave, refer to Appendix 1.

A month before the first wave of data collection, all participating students took part in an intelligence testing procedure based on the Cattell-Horn-Carroll theory of cognitive abilities (Schneider & McGrew, 2018) which measured both fluid and crystallized intelligence (CoVaT-CHC; Magez et al., 2015). This test has been shown to be reliable and valid in Belgian student populations with the same age range as the current study's participants (Tierens, 2017). In the present study as well, the test showed good reliability, as the items assessing fluid intelligence had a Cronbach's alpha of .85 and the items assessing crystallized intelligence had a Cronbach's alpha of .79. Students' test scores were compared with a representative norming sample which produced a normed IQ score with population mean 100 and standard deviation 15. Supporting validity of the test in the current sample, the IQ score showed a medium-high correlation with student grades ($r = .57$), which is very close to the overall average value of $r = .54$ between intelligence and school grades found in a meta-analysis of 240 independent secondary school samples (Roth et al., 2015). The results from the intelligence test or IQ scores were not disclosed to students, teachers, or parents. This strategy prevented sample bias by allowing for the inclusion of students who have not been labeled as gifted or have not participated in a program designed for talented students (Subotnik et al., 2011).

For the current study, a smaller sample of 403 high-ability students ($M_{IQ} = 127.68$, $SD_{IQ} = 7.80$, $M_{age} = 12.2$ years, 60.5% males) were selected from the larger sample. These students scored in the top 10% of in terms of cognitive ability ($IQ \geq 120$), which is consistent with the definition of cognitive giftedness as described by the Differentiated Model of Giftedness and Talent by Gagné (2009). Scores ranged from 120 to 150, which was the maximum score possible in this assessment. One participant dropped out of the study after the cognitive test, resulting in an analytical sample of 402 students.

Data collection occurred in the fall and spring of the school years 2017-2018 and 2018-2019. At the outset of the data collection, all participants took IQ tests and completed

questionnaires assessing personality traits. At each of the four waves, students completed a self-report loneliness questionnaire. In line with common practices in studying social dynamics, peer nominations were used to evaluate the social context at each wave of data collection (Cillessen & Marks, 2017; Gifford-Smith & Brownell, 2003). Students were presented with a series of questions about their peers (e.g., "Who in your class do you like most?") and were provided with a list of their classmates. For each question, they had the option to nominate an unlimited number of peers (Terry, 2000).

Measures

Loneliness

Participants reported on their levels of loneliness using a brief version of the peer-related loneliness subscale of the Loneliness and Aloneness scale for Children and Adolescents (Goossens, 2016; Marcoen et al., 1987). This self-report questionnaire was specifically developed for Dutch-speaking participants and has shown high internal consistency (i.e., Cronbach alpha > .80) and adequate construct validity, as revealed through high correlations (i.e., r > .70) with other loneliness measures (Goossens, 2016). Peer-related loneliness was measured using 6 items (e.g., "I feel left out by my classmates."). Students responded using a 4-point Likert-type scale, with options ranging from 1 = never to 4 = often ($\alpha_{wave\ 1} = .91$; $\alpha_{wave\ 2} = .89$; $\alpha_{wave\ 3} = .88$; $\alpha_{wave\ 4} = .90$). The final loneliness score for each student was derived from the average score across the six items, with a higher score indicating more frequent experiences of loneliness.

Giftedness Label

At the first wave of data collection, parents were asked if their child had been formally identified as gifted in the past. Parents were asked if their child was diagnosed as gifted, and if yes, in what year the assessment took place and whether a cognitive ability test had been completed in the process. Students were categorized as formally identified as gifted if at least one parent reported a gifted label and referred to an intelligence test score above 120 to support this. Within

the analytic sample, 369 of the students, or 92% of the sample, had at least one parent respond. Of these 369 students, 46 students were formally identified as gifted (11% of the analytic sample). For 32 of these students, both parents indicated that the student was diagnosed as gifted based on an assessment that included intelligence testing, and at least one parent indicated the score and year of the test. Of the remaining 14 students, only one parent per student completed the questionnaire and indicated that this student had been formally labeled as gifted. These parents also provided the year of testing and their child's test score.

Personality

The Quick Big Five personality test was used to measure the personality dimensions extraversion, emotional stability, and agreeableness (Vermulst & Gerris, 2005). In line with the terminology used when stating our expectations, students' scores were multiplied by -1 and the three dimensions were referred to using their negative labels (i.e., introversion, neuroticism, and antagonism). Each personality trait was assessed using six items in which participants were asked to rate the extent to which an adjective applied to them on a 7-point scale ranging from completely untrue to completely true ($\alpha_{introversion} = .76$, $\alpha_{neuroticism} = .79$, $\alpha_{antagonism} = .80$).

Peer Acceptance

Following the approach of Coie et al. (1982), during the peer nomination procedure, students indicated which classmates they liked most ("Who in your class do you like most?"). For each student, the number of incoming nominations on this question was summed. A proportion score was then calculated by dividing the sum by the number of students in each class.

Peer Rejection

Similar to the measurement of peer acceptance all participating students were asked which classmates they did not like ("Who in your class do you like least?"). Again, proportion scores were calculated by counting the number of incoming nominations each student and dividing this sum by the number of students in the class (Coie et al., 1982).

Victimization

Students received a score on peer victimization determined by the number of times their peers nominated them as being victimized ("Who in your class is bullied by others?"), divided by the number of students in their class. The reliability and validity of peer nomination measures to assess victimization has been supported in several studies (e.g., Bouman et al., 2012; Ladd & Kochenderfer-Ladd, 2002).

Friendship Quantity

Students nominated their friends in the peer nomination procedure ("Who in your class are your best friends?"). If two students nominated each other, this was considered a reciprocal friendship. For each student, the number of reciprocated friendships was counted and divided by the number of students in their class. This method has been developed by Coie and colleagues (1982) and has become a standard in the peer relationships research field (Bukowski & Hoza, 1989; Cillessen & Marks, 2017; Gifford-Smith & Brownell, 2003).

Statistical Analysis

The preparation and analyses of the data were all done using SAS Enterprise Guide version 8.3. All variables except for the dichotomous variables (i.e., gifted label and gender) were standardized across time points to the group mean and standard deviation. Using multilevel growth curve modeling, a hierarchical model was developed modeling loneliness over four time points. In this hierarchical model, loneliness scores at different time points were nested within students and random effects were included to measure the variation between students. The models in the current study included random intercepts, to account for variation between students' average level of loneliness, and a random slope at the student level to account for variations in growth rate between students.

Statistical analysis consisted of running six different growth curve models. The first model was an empty model that only included the time variable. In the second model we tested the

giftedness characteristics (i.e., IQ and giftedness label) as predictors of loneliness (H1a-b). In the third model, the personality traits introversion, neuroticism, and antagonism were used as predictors (H2a-c). The fourth model addressed the role of peer acceptance, peer rejection, victimization, and friendship quantity as predictors of loneliness (H3a-d). In the fifth model, all giftedness characteristics, personality characteristics, and social context characteristics were included in the same model as well as the effect of gender (H4a) to draw a comprehensive picture of the predictors of loneliness development. The final model focused on gender differences in the effect of the social context on loneliness development (H4b) by including interaction effects between gender and the social context characteristics.

Results

Descriptive Results

Descriptive statistics of the constant variables (i.e., IQ, giftedness label, personality, and gender) and the time-varying variables at each wave of data collection (i.e., peer acceptance, peer rejection, friendship quantity, victimization, and loneliness) are displayed in Table 1. IQ scores ranged from 120-150, while loneliness scores ranged from 1 to 4, spanning the range of the four-point scale. For personality variables, scores ranged from 1.5 to 7 for Extroversion, from 3 to 7 for Antagonism, and from 1 to 6.83 for Neuroticism. Correlations among all study variables are represented in Table 2. To increase readability, time-varying variables were averaged across time for every student. The correlations among the social context variables were highly significant but moderate in size showing that, while connected, these constructs all captured different elements of the students' social context. All four measures were also correlated with students' IQ scores, such that higher cognitive ability was connected to lower peer acceptance, and friendship quantity and higher peer rejection and victimization. All predictors except for gender were also significantly correlated to loneliness. This pattern of findings supports the hypothesis that these individual and

social context factors could be significant predictors of loneliness in the main analyses using hierarchical modeling.

[Insert Tables 1 and 2 about here]

The evolution of the unstandardized loneliness scores is plotted in Figure 1. This plot shows that levels in loneliness vary both between students and within individual students over time. The majority of the students reports relatively low loneliness scores. However, a substantial number of students also report more elevated levels of loneliness at least at one time point.

[Insert Figure 1 about here]

Main Analysis

Results for the different growth curve models of loneliness are all presented in Table 3. In Model 1 we only took into account the evolution across time and showed that, when no other factors were taken into account, high-ability students' loneliness increased over time. In Model 2, we added the effects of IQ and gifted label. In line with H1a, IQ was a significant predictor of loneliness. Within the group of high-ability students, students with higher levels of cognitive ability reported higher levels of loneliness. The effect of the gifted label was not significant, which was not what we expected to find (H1b). However, the number of students labeled as gifted was quite small (n = 46), and this could have been the reason for the non-significance. In Model 3, the three personality characteristics were tested as predictors of loneliness. All three characteristics were found to significantly predict loneliness, confirming our expectations (H2a-c). Students who were more introverted (H2a), more antagonistic (or less agreeable) (H2b), and more neurotic (or less emotionally stable) (H2c) felt lonelier over time. Coefficients should be interpreted in terms of deviations from the mean so that, for example, in the case of introversion, students who score one standard deviation above the mean on the introversion scale, are expected to experience an increase in loneliness of 0.15 standard deviations from the mean loneliness score, taking into account time and the other personality characteristics. The social context indicators were included

in Model 4 and were all significant except for peer rejection. Confirming our hypotheses, scoring higher on peer acceptance and friendship quantity predicted lower loneliness scores (H3a & H3d) whereas scoring higher on victimization predicted higher levels of loneliness over time (H3c). Only the expectation for higher peer rejection predicting higher levels of loneliness (H3b) was not confirmed.

[Insert Table 3 about here]

In Model 5, gender and all individual and social context predictors were combined in a single model. Contrary to expectations (H4a), no differences in loneliness levels over time were found between high-ability girls and boys, taking into account social context factors and other individual factors. This model did show a significant increase in loneliness over time and higher levels of intelligence were associated with higher levels of loneliness. The effect of the personality characteristics introversion and antagonism were still significant whereas neuroticism no longer significantly predicted loneliness. Peer acceptance, friendship quantity, and victimization still significantly predicted loneliness, taking into account the individual characteristics.

Finally, in Model 6, the interaction effects of gender were added to the model. This model showed a significant interaction between peer rejection and gender and between peer victimization and gender. Being rejected increased loneliness among girls but not among boys, confirming our expectation (H4b). Being victimized increased loneliness for all high-ability students but the effect was found to be stronger for boys.

Discussion

This study explored variations in the social-emotional development of high-ability students by examining individual and social context predictors of loneliness. Rather than simply comparing high-ability students as a collective entity against average-ability students, our aim was to delve into the distinctions within the high-ability group. By focusing on differences within the group of high-ability students, we sought to move beyond the current debate in the giftedness literature, in

which high-ability students are often juxtaposed as a group against average-ability students and researchers primarily seek to find evidence for either the risk or the resilience hypothesis. Our study strove to reconcile these contrasting assumptions by examining the conditions that make high-ability students susceptible to loneliness, thus providing variation of loneliness experiences within the group. In doing so, we also hoped to provide nuance to prevailing stereotypes about the social experiences of high-ability students that view this group monolithically. We found that level of cognitive ability, introversion, neuroticism, peer acceptance, friendship quantity, and victimization all had a unique contribution to the prediction of loneliness development throughout Grade 7 and Grade 8. These results highlight the importance of looking at high-ability students as a diverse group of individuals, each navigating adolescence in unique ways. Variations in individual differences and social contexts contribute to distinct social experiences among these students. As such, educational guidance for high-ability students, whether in the socioemotional or academic domain, should be tailored to address the unique circumstances of each individual.

While all high-ability students possess elevated levels of intelligence, the findings of this study indicate that within this group, higher levels of intelligence are associated with greater feelings of loneliness. Specifically, high-ability students with higher levels of intelligence levels experience a more significant cognitive gap with their average peers, surpassing the gap observed in high-ability students with only moderately elevated levels of intelligence. These results validate the person-environment fit theory (Mueller & Winsor, 2018), illustrating that a greater disparity between students and their environment results in heightened developmental challenges, such as an increased sense of loneliness.

Comparisons between the present study's findings and other studies examining loneliness among the general student population of a similar age in the Flemish context further suggest that high-ability students exhibit similar or even a bit higher levels of loneliness compared to their peers. While the high-ability middle school students in the current study reported a mean

loneliness score of 1.70, in other studies using the LACA scale mean loneliness scores have been generally slightly lower (M = 1.54, 1.50 in Grades 7 and 8 in Geukens et al., 2020; M = 1.53, 1.54, 1.63 across three early adolescent samples in Danneel et al., 2020). Given the risk entailed by loneliness for poor mental outcomes (Asher & Paquette, 2003; Lodder et al., 2017; Vanhalst et al., 2014) and maladjustment (Asher & Paquette, 2003; Woodhouse et al., 2012; Young, 1981), it seems prudent for educators to consider high-ability students at risk for loneliness, and to monitor students accordingly. By the fourth wave of the current study, 30% of the high-ability students indicated frequent feelings of loneliness, indicating a sizable number of lonely high-ability students.

In future studies, researchers should focus on why students with highly elevated intelligence levels feel lonelier. Is this mainly because of a mismatch with the peer environment, such as a mismatch in interests, or do they experience issues in their socioemotional development because of an asynchrony with their cognitive development (Mueller & Winsor, 2018)? The correlational analyses rather point to peer group mismatches and not general emotional problems, as they showed that higher levels of intelligence were not related with more neuroticism or emotional lability, but they were significantly (albeit weakly) related with lower peer acceptance and friendship quantity and with higher peer rejection and victimization. An important caveat to note is that while there were individuals with exceptionally high ability within the sample of the current study (n = 127 students with IQ ≥ 130, of which 15 students had an IQ above 145), the sample average IQ was 127.68, which indicates that the sample is generally more indicative of mild to moderately high ability students. It could be that findings would be more pronounced within a profoundly high ability sample (i.e., IQ ≥ 145), given their more pronounced asynchronous development (Mueller & Winsor, 2018). Because this group of exceptionally high-ability students was not investigated separately in the current study, it can be seen as a limitation that can be explored further in future research. Research into the nature of the relationships that

cognitively high ability students establish with their peers at various levels of intelligence may provide more nuance into these connections and answer the question of why increased levels of intelligence are associated with increased loneliness.

We expected that students labeled as gifted would show heightened levels of loneliness because of a higher risk of being stigmatized by and feeling different from their peers (Košir et al., 2016). Our findings partly support this hypothesis. The bivariate associations indicate that high-ability students labeled as gifted were more likely to be rejected and victimized by peers and tended to feel lonelier compared to non-labeled high-ability students. However, the regression analysis did not reveal any unique effects of the giftedness label when controlling for level of intelligence and social context factors. This suggests that it may not the gifted label per se, but rather these associated factors that play a more significant role in explaining loneliness. Future research should delve deeper into the interplay of these variables and their implications for feelings of loneliness.

With regard to personality characteristics, the high ability population exhibited similar patterns to those observed in the general population (Buecker et al., 2020). Specifically, high-ability students who displayed greater introversion, neuroticism, or antagonism reported elevated levels of loneliness. Individuals scoring high on these traits are likely to be perceived as less socially attractive, potentially leading to increased reports of loneliness. This is supported by the negative correlations between introversion and antagonism, on the one hand, and peer acceptance on the other.

As a second research objective we examined whether the social context of high-ability students was associated with their experience of loneliness. Results showed that peer acceptance, friendship quantity, and victimization all made a unique contribution to the prediction of loneliness. These findings align with findings from the general student population (Vanhalst et al., 2014), underscoring how these constructs capture various aspects of adolescents' peer interactions.

Loneliness is not solely determined by individual characteristics but can also be influenced by the social environment in which the student is situated. Therefore, when addressing loneliness in high-ability students, it is important not only to focus on improving their social skills but also to consider and intervene in the student's social context.

Finally, we explored gender differences within the high-ability population. Contrary to our expectations, the results revealed no mean differences in loneliness between high-ability boys and girls. These findings align with patterns observed in the general population, where no distinctions in loneliness experiences between men and women were identified (Maes et al., 2019). Nevertheless, the results did highlight gender-based variations in how the social context influences loneliness. Although the main effect of peer rejection was not significant overall, higher levels of peer rejection did predict increased loneliness for girls. In other words, being disliked by classmates resulted in greater feelings of loneliness for girls compared to boys facing a similar degree of peer rejection. This confirms the gender role socialization perspective, which states that being liked by others is more important for girls than for boys because girls place a higher value on their position within the group (Kerr et al., 1988; Reis, 2002). Additionally, the impact of victimization differed between boys and girls. For boys, being victimized was more strongly associated with feelings of loneliness. Victimized boys, in general, are less inclined to seek social support than victimized girls (Hunter & Boyle, 2004), perhaps because they struggle to share their experiences with others, leading to increased feelings of loneliness.

Strengths and Limitations

With this study we aimed to make a meaningful contribution to research in the field of loneliness and giftedness, some limitations of our study need to be addressed. First, we suggested the feeling of being different as a potential source of loneliness, but the study lacked a direct measure for this construct. Future research should examine the role of feeling different and its potential mediation between certain predictors (e.g., level of cognitive ability, being victimized)

and feelings of loneliness. Second, the social context factors in this study all focused on relationships within the classroom. It is plausible that students who have mostly negative peer relationships at school may have more positive connections outside of school. It is also quite possible, given the tendency of high-ability students to befriend older individuals whose age corresponds more to their mental age (Silverman, 2002), that students could have more positive relationships with students in higher grades at school. Positive relationships with others in higher grades or outside of school may also protect high ability adolescents from feeling lonely, even if they lack these relationships with their classroom peers. Third, while we included a measure of friendship quantity to assess the protective role of mutual friendships against loneliness, it is important to recognize that friendship quantity might not fully capture the multidimensional nature of friendship. Future research should investigate the impact of other dimensions, such as friendship quality, on feelings of loneliness. Fourth, we assessed victimization using a peer nomination procedure, offering the advantage of incorporating multiple perspectives to identify victims. However, future research could benefit from also including self-reports of victimization, allowing students to express their experiences of being victimized. Fifth, it is worth noting that the study was conducted entirely in Flanders, Belgium, and as such caution should be taken when generalizing the findings of this study to other cultural contexts. Ideally, the study should be replicated in other countries to clarify the extent to which the findings are generalizable. Finally, the formal labeling of gifted students was based on parent reporting, which introduces the possibility that some parents mistakenly indicated their child as identified or unidentified as gifted. While cognitive testing was part of all assessments, giftedness labels may have been assigned using varying definitions and criteria. Moreover, students who received a gifted label according to the criteria of this study were not necessarily aware that they had been diagnosed as gifted, which could imply that the label would not have the hypothesized effect on the students' social

relationships. Consequently, we emphasize that these results should be considered exploratory, and we encourage researchers to further investigate the impact of the gifted label on social experiences.

Despite the mentioned limitations, the present study has considerable strengths. It used a large sample consisting of students from various classes in different schools, tracked across multiple points over an extended period of time. Notably, the study did not recruit participants form a specialized program for high ability students, but instead employed a standardized procedure and a validated measurement instrument for selection of high-ability students. This approach guaranteed the inclusion of both formally identified and unidentified cognitively high-ability students, avoiding potential sampling bias. Finally, this study used multiple informants, incorporating both self- and peer-reports, thereby integrating different perspectives and preventing inflated associations between variables.

Implications for Research and Practice

The findings from this study emphasize the considerable diversity within the population of high-ability students. It is evident that it is not solely their ability level but rather the individual differences and social context variations that determine whether a high-ability student is at an elevated risk of experiencing loneliness. Research should therefore move beyond mere comparisons between average- and high-ability populations. The focus should shift towards identifying differences within the high-ability group, as this can yield meaningful insights to improve educational pathways and support for these students. For instance, research adopting a more person-oriented approach could examine whether distinct profiles exist regarding the social-emotional functioning of high-ability youth. These profiles could offer valuable insights into the development of high-ability students, potentially aiding educators in providing targeted support for their academic journeys.

Another interesting direction for future research to reveal more nuance within the high-ability group is to examine potential differences in loneliness among students who are highly able

in either crystallized or fluid intelligence rather than both. We made the decision to aggregate crystallized and fluid intelligence in the present study, given the centrality of both constructs in general intelligence according to the CHC-model (Schneider & McGrew, 2018) and the moderately high correlations between the two constructs within the study's sample (r = .49, p <.001). Previous work examining domain-related differences in social relationships among high-ability students has found that students with high verbal ability report more difficulties with peer relationships than students with high math ability (Lee et al., 2012), likely due to the visible nature of verbal high ability in (peer) communication. Future work could investigate whether verbally precocious students also report more loneliness due to these difficulties.

Consistent with prior findings in the literature, the results of this study underscore that loneliness is a complex phenomenon influenced by various individual and social contextual factors. This pattern of findings highlights the need for educators to pay attention to various aspects of the social context of high-ability students, implying that teachers should not only pay attention to meeting high-ability students' cognitive needs, but also to facilitating their relationships with other students in their class. In addition, enrichment programs designed for high-ability students may support their connection with peers who share similar abilities and interests. An earlier study by van Rossen et al. (2021) indicated that high-ability students in pull-out programs had more positive perceptions of their peer relationships at the end of the school year compared to high-ability students in regular classrooms. Interactions with peers possessing similar cognitive capabilities and interests can contribute to high-ability students feeling less different and, consequently, experiencing less loneliness.

In this study we identified various risk factors that contribute to loneliness among high-ability students. It is crucial for teachers to be aware of these factors, as they can increase the likelihood of loneliness, and to support students in addressing these risks, such as by facilitating the formation of friendships. Based on the findings of this study, we can state that students with

higher intelligence are one type of student that may need extra support and attention regarding their social interactions. Beyond this, students who are more introverted and who indicate emotional instability may also need extra assistance. One way to address these competences is by implementing in-school interventions to combat loneliness. A recent meta-analysis by Eccles and Qualter (2021) found that several interventions were effective in countering loneliness among at-risk students. One such intervention is Friendly Schools, an intervention that involves the whole school (i.e., teachers, care staff, guidance counselors, etc.) and aims to increase students' social and emotional skills and while reducing bullying and aggressive behavior. This intervention has demonstrated effectiveness in reducing loneliness among participants (Cross et al., 2018). There has been significant policy attention and funding towards anti-bullying initiatives in recent years, but policymakers should consider taking a broader stance beyond targeting peer victimization towards targeting positive, inclusive peer relationships in general, and supporting the social skills required to foster these relationships. Particularly for early adolescents, for whom high-quality peer relationships are crucial for developmental needs, interventions that promote positive social interactions can help address the mismatch between the school environment and adolescents' developmental needs (e.g., stage-environment fit theory, Eccles et al., 1993). These interventions can contribute to reinforcing positive psychological development during the vulnerable period of early adolescence. The findings of the current study, highlighting the relationships of friendship quantity, peer acceptance, and victimization with loneliness among early adolescents, underscore the developmental significance of these peer relationships. In addition to teachers being aware of and actively encouraging peer relationships among their students, parents should also recognize the importance of peer relationships and facilitate these for their children, taking proactive initiative when their children seem socially isolated. This may also include seeking social skills training or psychotherapy. A recent meta-analysis focusing on adolescents found that social skills training and psychotherapy reduced loneliness in youth (Eccles & Qualter, 2021).

This study sheds light on the diverse social experiences among high-ability youth and underscores the significance of both individual and contextual factors in shaping these experiences. Variations in individual traits and social environments play a significant role in determining the unique social experiences of these students. Consequently, educational support for high-ability students, whether addressing socioemotional or academic needs, should be customized to accommodate the specific circumstances of each individual.

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Table 1

Descriptive Statistics of the Constant and the Time-Varying Variables per Time Point

	Overall	Grade 7		Grade 8	
Variable	Mean	Fall	Spring	Fall	Spring
Gender (girls) %	38.96				
Label (yes) %	11.41				
IQ *(SD)*	127.68 (7.81)				
Introversion *(SD)*	3.29 (1.11)				
Neuroticism *(SD)*	3.69 (1.14)				
Antagonism *(SD)*	2.48 (0.67)				
Peer acceptance (SD)	**0.20 (0.12)**	**0.20 (0.12)**	**0.20 (0.11)**	**0.21 (0.12)**	**0.19 (0.13)**
Peer rejection *(SD)*	**0.10 (0.13)**	**0.10 (0.11)**	**0.11 (0.13)**	**0.11 (0.13)**	**0.10 (0.13)**
Friendship quantity *(SD)*	0.10 (0.07)	0.09 (0.07)	0.10 (0.07)	0.10 (0.06)	0.10 (0.07)
Victimization *(SD)*	0.01 (0.05)	0.01 (0.03)	0.02 (0.06)	0.02 (0.06)	0.01 (0.05)
Loneliness *(SD)*	1.70 (0.69)	1.65 (0.65)	1.70 (0.69)	1.68 (0.69)	1.77 (0.73)

Table 2

Point Biserial and Pearson's Product Moment Correlations Among the Study Variables (Averaged Across Time Points)

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Gender [a]	-									
2. Label [b]	-.08**	-								
3. IQ	-.07**	.24***	-							
4. Introversion	.01	.05*	.05	-						
5. Neuroticism	.10***	.06*	.03	.43***	-					
6. Antagonism	-.05	.04	.10***	.15***	.02	-				
7. Peer acceptance	**.03**	**-.06***	**-.08****	**-.17*****	**-.03**	**-.10*****	**-**			
8. Peer rejection	**-.04**	**.15*****	**.10*****	**.06***	**-.02**	**.08****	**-.30*****	**-**		
9. Friendship quantity	.07**	-.06*	-.10***	-.14***	-.02	-.10***	**.47*****	**-.27*****	-	
10. Victimization	-.04	.14***	.12***	.09***	.06*	.07*	**-.16*****	**.39*****	-.13***	
11. Loneliness	.01	.09***	.13***	.22***	.25***	.11***	**-.21*****	**.16*****	-.25***	.21***

[a] Boys = 0, Girls = 1. [b] No label = 0, Label = 1.

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

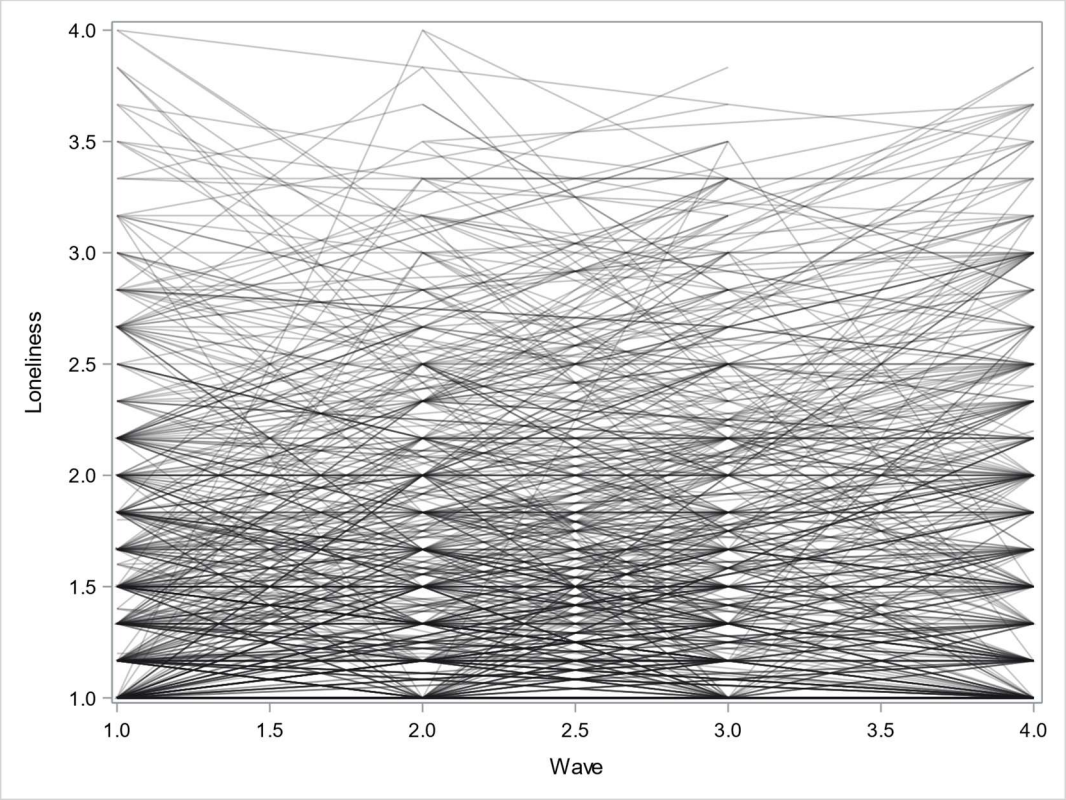
Table 3
Multilevel Growth Curve Estimates of the Individual and Contextual Predictors of Loneliness

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Predictor	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Time	0.03*	0.01	0.02	0.01	0.03	0.01	0.03*	0.01	0.03*	0.01	0.03*	0.01
IQ			0.11*	0.04					0.08*	0.04	0.08*	0.04
Label [a]			0.13	0.12					-0.001	0.11	-0.02	0.11
Introversion					0.15***	0.04			0.11***	0.04	0.12**	0.04
Neuroticism					0.19***	0.04			0.20***	0.04	0.20***	0.04
Antagonism					0.10*	0.04			0.05	0.04	0.06	0.04
Peer acceptance							-0.12***	0.03	-0.10***	0.03	-0.09**	0.03
Peer rejection							0.05	0.03	0.05	0.03	-0.01	0.03
Friendship quantity							-0.10***	0.02	-0.10***	0.02	-0.10***	0.03
Victimization							0.14***	0.02	0.13***	0.02	0.23***	0.03
Gender [b]									-0.06	0.06	-0.07	0.06
Peer acceptance * Gender [b]											-0.04	0.06
Peer rejection * Gender [b]											0.16**	0.06
Friendship quantity * Gender [b]											0.02	0.05
Victimization * Gender [b]											-0.25***	0.05
Student Level Intercept	0.42	0.05	0.41	0.05	0.32	0.04	0.34	0.04	0.26	0.04	0.25	0.04
Time	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01
Residual	0.43	0.02	0.44	0.02	0.44	0.02	0.41	0.02	0.41	0.02	0.40	0.02

[a] No label = 0, Label = 1. [b] Boys = 0, Girls = 1.
* $p < .05$. ** $p < .01$. ***$p < .001$.

Figure 1

Evolution of the Loneliness Scores by Student Across Waves



Appendix 1

All Constructs reported by student participants in the TALENT study by Measurement Wave

Construct	Wave 1	Wave 2	Wave 3	Wave 4
Motivation	x	x	x	x
Amotivation	x	x	x	x
Need for Cognition		x		x
Engagement	x	x	x	x
Boredom	x	x	x	x
Flow and Burnout	x	x	x	x
Goal Orientation		x		
Learning Strategies	x	x	x	x
Academic Performance	x	x	x	x
Homework	x	x	x	x
Underachievement	x	x	x	x
Self-Concept	x	x	x	x
Perfectionism	x	x	x	x
Achievement motivation	x	x	x	x
Test anxiety and procrastination	x	x	x	x
Worrying	x	x	x	x
Contingent Self-Worth	x	x	x	x
Externalizing/Internalizing problem behavior	x	x	x	x
Mindset	x	x	x	x
Social Coping		x		x
Loneliness and social acceptance	x	x	x	x
High sensitivity		x		
Self-Handicapping				x
Psychological cost				x
Psychological Needs Satisfaction				x
Personality	x			
Interests	x			x
Peer Nominations	x	x	x	x
Study Orientation	x			x
Ideal Teacher	x			
Teachers: Autonomy Support	x	x	x	x
Teachers: Affiliation and Dissatisfaction	x	x	x	x
Teachers: Conditional Regard	x	x	x	x
Curricular Challenge	x	x	x	x
Math: Engagement and Challenge	x	x	x	x
Math: Value Beliefs, Underachievement, Self-concept	x	x	x	x
Math Teacher: Teaching Style	x	x	x	x
French: Engagement and Challenge	x	x	x	x
French: Value Beliefs, Underachievement, Self-Concept	x	x	x	x
French Teacher: Teaching Style	x	x	x	x
Parents: Engagement, Autonomy Support, Psychological Control	x	x	x	x
Parents: Structure, Expectations, Conditional Regard	x		x	
Parents: Person/Process-centered praise	x		x	
Study Choice: Certainty, Choice, Reason				x

Note: An 'x' indicates that a measurement of a given construct was measured during a given data collection wave