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Self-Esteem Trajectories and their Social Determinants in Adolescents with Different Levels of Cognitive Ability

Alexandre J. S. Morin*, Ph.D.,
Substantive-Methodological Synergy Research Laboratory Department of Psychology, Concordia University, Montreal, Canada, alexandre.morin@concordia.ca
A. Katrin Arens*, Ph.D.,
German Institute for International Educational Research, Frankfurt, Germany, arens@dipf.de
Danielle Tracey, Ph.D.,
Western Sydney University, Sydney, Australia, D.Tracey@westernsydney.edu.au
Philip D. Parker, Ph.D.,
Institute for Positive Psychology and Education, Australian Catholic University, Strathfield, Australia, Philip.Parker@acu.edu.au
Joseph Ciarrochi, Ph.D.,
Institute for Positive Psychology and Education, Australian Catholic University, Strathfield, Australia, Joseph.Ciarrochi@acu.edu.au
Rhonda G. Craven, Ph.D.,
Institute for Positive Psychology and Education, Australian Catholic University, Strathfield, Australia, Rhonda.Craven@acu.edu.au
Christophe Maïano, Ph.D.,
Université du Québec en Outaouais, Saint-Jérome, Canada, christophe.maiano@uqo.ca

Acknowledgements

* The first two authors (A.J.S.M. & A.K.A.) contributed equally to this article and their order was determined at random: both should thus be considered first authors.

This paper was partly prepared while the first author was a visiting scholar at the German Institute for International Educational Research. Preparation of this article was supported by research grants from the Australian Research Council (DP140101559) awarded to the first, third, sixth and seventh authors, from the Social Sciences and Humanities Research Council of Canada (430-2012-0091, 435-2014-0909) awarded to the first, third and seventh authors, and by fellowship grants from the Australian Research Council respectively awarded to the fifth (FT100100656) and fourth (DE140100080) authors. Data collection for this project was funded by the Australian Research Council (DP140103874).

This is the final prepublication version of:
Morin, A.J.S., Arens, A.K., Tracey, D., Parker, P.D., Ciarrochi, J., Craven, R.G., & Maïano, C. (2017). Self-esteem trajectories and their social determinants in adolescents with different levels of cognitive ability. *American Journal on Intellectual and Developmental Disabilities*. DOI: 10.1352/1944-7558-122.6
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Corresponding author:
Alexandre J.S. Morin
Substantive-Methodological Synergy Research Laboratory
Department of Psychology, Concordia University
7141 Sherbrooke W, Montreal, QC, Canada, H4B 1R6
Phone: (+1) 514-848-2424 ext. 3533
Email: alexandre.morin@concordia.ca
http://www.concordia.ca/faculty/alexandre-morin.html
http://explore.concordia.ca/alexandre-morin
http://smslabstats.weebly.com/

Abstract

This study examines the development of self-esteem in a sample of 138 Australian adolescents (90 boys; 48 girls) with cognitive abilities in the lowest 15% (L-CA) and a matched sample of 556 Australian adolescents (312 boys; 244 girls) with average to high levels of cognitive abilities (A/H-CA). These participants were measured annually (Grade 7 to 12). The findings showed that adolescents with L-CA and A/H-CA experience similar high and stable self-esteem trajectories that present similar relations with key predictors (sex, school usefulness and dislike, parenting, and peer integration). Both groups revealed substantial gender differences showing higher levels of self-esteem for boys remaining relatively stable over time, compared to lower levels among girls which decreased until mid-adolescence before increasing back.

Keywords: self-esteem; development; determination; low cognitive ability; secondary school

Self-esteem refers to the positive or negative way people globally feel about themselves (Brown, Dutton, & Cook, 2001) and an indicator of successful coping with key developmental tasks (Craven & Marsh, 2008). To achieve a better understanding of self-esteem development, previous research has looked at self-esteem trajectories and their determinants across the lifespan (Cole et al., 2001; Orth, Trzesniewski, & Robins, 2010). However, this research has been limited by the lack of consideration of potentially important sources of population heterogeneity. For example, Morin, Maïano, Marsh, Janosz, and Nagengast (2011) found that self-esteem trajectories remained high and stable during adolescence in their total sample, as well as in males and females from ethnic minorities and majority groups. However, substantial inter-individual variability remained, making it critical for research to focus on subgroups with low self-esteem likely to require special attention.

Youth with low levels of cognitive abilities (L-CA) potentially represent one such group. These youth form a high risk population with an increased vulnerability for a variety of physical and psychological difficulties that adversely impact on life potential and their inclusion and participation in society (Oseburg et al., 2011; Whitaker & Read, 2006). Given that these youth tend to be exposed more frequently to a variety of stressful experiences ranging from academic failure to peer rejection and victimization (e.g., Maïano, Aimé, Salvas, Morin, & Normand, 2016; Rose, Monda-Amaya, & Espelage, 2011; Valas, 1999), it is vitality important to obtain a clearer picture of the mechanisms involved in their healthy psychological development. Furthermore, because of their more limited cognitive and social skills, youth with L-CA tend to be more dependent on parents and teachers than their peers with average to high levels of cognitive abilities (A/H-CA) (e.g., Craven, Morin, Tracey, Parker, & Zhong, 2015; Wehmeyer, 2005). This greater dependency suggests that the mechanisms at play in their development may differ from those at play in populations of youth with A/H-CA.

In this study, we contrast the developmental trajectories of self-esteem, as a critical indicator of successful psychosocial adaptation (Craven & Marsh, 2008) among matched samples of adolescents with L-CA and A/H-CA in order to assess the extent to which the identified developmental processes generalize across samples. We also examine family, school and peer-related determinants of these trajectories, and the extent to which these predictors generalize across subgroups.

Self-Esteem Development

Self-esteem tends to decrease across the transition into adolescence, and then to increase across the next transition into adulthood (Huang, 2010; Orth et al., 2010). However, studies focusing specifically on the adolescent years remain equivocal, reporting either small increases in self-esteem (e.g., Greene & Way, 2005; Steiger, Allemand, Robins, & Fend, 2014), small decreases (e.g., Diseth, Meland, & Breidablik, 2014; Way, Reddy, & Rhodes, 2007), small non-linear trends (e.g., Birkeland, Melkevik, Holsen, & Wold, 2012), or stable levels of self-esteem (e.g., Morin et al., 2011). Although equivocal, these studies suggest that changes in average levels of self-esteem remain minimal in adolescence. However, these results also clearly show that adolescent boys tend to present higher levels of self-esteem than girls across the course of adolescence, which can possibly be explained by girls' greater levels of sensitivity to the multiple biopsychosocial transformations characteristic of this developmental period (e.g., Diseth et al., 2014; Morin et al., 2011; Steiger et al., 2014).

The observation that changes in self-esteem levels remain minimal once the transition into adolescence is completed is not surprising. Whereas the transition into adolescence is marked by acute concerns with how members of changing and increasingly differentiated social systems (e.g., school, family, peers) perceive oneself, the sense of self becomes increasingly coherent and less dependent on others during middle and late adolescence as youth become more invested into their schoolwork, gain autonomy from parents, and join stable peer groups (Harter, 2012a, 2012b; Lerner, 2002). Although a wide variety of factors are likely to be involved in shaping adolescents' self-esteem, stage-environment fit (Eccles et al. 1993) and self-determination (Ryan & Deci, 2000, 2012) theories both emphasize the critical role of schools, parents, and peers in fulfilling adolescents' basic needs for competence, autonomy, and relatedness. The school context is likely to play a determining role in fulfilling the need for competence as adolescents come to internalize the value and utility of what is learned at school as forming a critical part of their own developing identity. In contrast, adolescents who see school as meaningless are likely to question their ability to develop significant competencies. The family context is likely to play a key role in fulfilling adolescents' needs for a greater level of autonomy when parents encourage youth to make their own decisions in a supportive manner through the use of authoritative parenting practices, rather than try to maintain control through the reliance on more rigid autocratic parenting practices. Authoritarian parents exert a high level of control on their

adolescents without necessarily taking their views and needs into account, whereas authoritative parents make an effort to balance control with warmth and responsiveness, while being open to discussion with the objective of enabling the growth of autonomy (Baumrind, 1971; Darling & Steinberg, 1993). Finally, as adolescents gain increased autonomy from their families, the ability to form meaningful friendships through integration into stable and meaningful peer groups is likely to play a critical role in fulfilling their needs for relatedness. These propositions are also consistent with the sociometer theory (Leary, 2008; Leary & Baumeister, 2000), which positions self-esteem as a core component of the relational self-monitoring system – a social construct purported to reflect the extent to which individuals regard their social relationships as satisfactory.

Not surprisingly, studies have generally supported the assertion that higher levels of perceived school usefulness, as well as lower levels of negative attitudes toward schooling, predicted higher levels of self-esteem in adolescence (e.g., Arens, Yeung, Nagengast, & Hasselhorn, 2013; Huebner & Gilman, 2006). Likewise, exposure to higher levels of authoritative and lower levels of authoritarian parenting have been shown to predict higher levels of self-esteem among adolescents (e.g., Arbona & Power, 2003; Laible, Carlo, & Roesch, 2004). However, an important limitation of most research conducted on the relations between parenting style and adolescents' self-esteem development is the lack of differentiation between maternal and paternal practices, or the sole focus on maternal style. Indeed, in the few studies that have separately considered both, the results have generally showed that both parents have distinct, and complementary effects on youth self-esteem development (e.g., Laible & Carlo, 2004; Milevsky, Schlechter, Netter, & Keehn, 2007). Finally, the quality of adolescents' relations with their peers, characterized by high levels of attachment or integration into peer groups, or low levels of loneliness and social isolation, were found to represent important predictors of self-esteem (Gorrese, & Ruggieri, 2013; Laible et al., 2004; Morin, Maïano, Marsh, Nagengast, & Janosz, 2013). However, a recent meta-analysis of 192 studies found that whereas self-esteem levels tend to increase as a function of positive social experiences (e.g., social integration), they did not tend to decrease as function of negative social experiences (e.g., rejection) (Blackhart et al., 2009).

Self-Esteem Development in Adolescents with Low Levels of Cognitive Abilities

For youth with A/H-CA, self-esteem has often been proposed to represent a key indicator of successful coping with the developmental challenges of adolescence and as a key determinant of successful participation in society (e.g., Craven & Marsh, 2008). In most studies conducted so far, scholars have postulated differences in self-esteem development between adolescents with L-CA and their peers with A/H-CA, assuming that youth with L-CA would present lower levels of self-esteem than their peers with A/H-CA (Nader-Grosbois, 2014). So far, numerous cross-sectional studies have examined the self-esteem development of adolescents with L-CA (Cadieux, 1992; Crawford, 1976; Gowans & Hulbert, 1983; Lawrence & Winschel, 1973; Luftig, 1982). However, results from these studies have been mostly inconclusive regarding possible differences between youth with L-CA and youth with A/H-CA. Indeed, whereas some studies reported lower self-esteem in adolescents with L-CA compared with their peers with A/H-CA (e.g., Chiu, 1990; Chovan & Morrison, 1984; Jones, 1985), other studies reported higher (e.g., Lemétayer & Kraemer, 2005; Ninot, Bilard, Delignières, & Sokolowski, 2000; Pierrehumbert, Zanone, Kauer-Tchicaloff, & Plancherel, 1988), or equivalent levels (e.g., Beck, Roblee, & Hanson, 1982; Carroll, Friedrich, & Hund, 1984; Huck, Kemp, & Carter, 2010). Methodological differences may partly explain some of these discrepant findings, such as possible differences in the gender and age compositions of samples across and within studies (i.e., whether the studies compared matched samples or convenience samples of youth with L-CA and A/H-CA), or lack of information regarding the psychometric properties of the self-esteem instruments used with adolescents with L-CA (Marsh, Tracey, & Craven, 2006; Nader-Grosbois, 2014; Tracey, Craven, & Marsh, 2015). These discrepancies reinforce the need to rely on stronger methodologies, involving the use of matched samples of youth with L-CA and A/H-CA and the reliance on latent variable analyses providing a control for measurement errors and ensuring the equivalence of the psychometric properties of the measures across samples.

Furthermore, only a limited number of longitudinal studies have examined the development of self-esteem or similar constructs among youth with L-CA, as well as possible developmental differences or similarities between adolescents with L-CA and A/H-CA. Three of these studies focused on children (Battle & Blowers, 1982; Boersma, Chapman, & Battle, 1979; Carroll, 1967) and one on adolescents (Cadieux, 2003). In addition, two further studies did not provide an indication regarding the age of the participants with L-CA (Calhoun & Elliott, 1977; Schurr, Towne, & Joiner,

1972). Looking specifically at adolescent development, Cadieux (2003) examined the development of perceived competence among a sample of 31 French-Canadian adolescents with L-CA compared to a matched sample of 152 adolescents with A/H-CA. In this 3-year longitudinal study, youth with L-CA were either schooled in a regular class or in special classes. The adolescents were asked to respond to the French version of the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter & Pike, 1984). Findings showed significantly higher levels of perceived cognitive and social competence in adolescents with L-CA schooled in special classes compared with their peers with A/H-CA. However, no significant differences were found between adolescents with L-CA schooled in a regular class and their peers with A/H-CA. Finally, over the 3-year period, no significant changes were observed in perceived cognitive, social and physical competences for all adolescents.

In sum, in contrast to adolescents with A/H-CA, the developmental trajectories of self-esteem among adolescents with L-CA remain an understudied area in need of further longitudinal research relying on stronger methodologies, and larger samples, than what has previously been used in this area. Such advances in research design and rigor are vital to progress in relation to the participation and equity championed in the United Nation (UN, 2006) convention on the rights of persons with disabilities. In addition, whereas research conducted among adolescents with A/H-CA clearly reinforces the importance of school, family, and peers in the development of self-esteem, the role of these factors in shaping self-esteem among youth with L-CA remains unknown. This is worrisome because, without empirical corroboration, one cannot confidently assume that the antecedents of positive self-esteem identified among youth with A/H-CA will apply equally well to youth with L-CA. For instance, although no studies have yet examined attitudes toward school and perception of the utility of what is learned at school among youth with L-CA, research shows that due to their more limited cognitive skills, these youth are more likely to experience failures in the educational area (e.g., Craven et al., 2015), making it less likely for them to fulfill their needs for competence based on traditional definitions of academic success (e.g., Weeks et al., 2014).

Furthermore, given their reported lower levels of autonomy (e.g., Wehmeyer, 2005), youth with L-CA tend to have a greater level of dependency on their parents, which may preclude the fulfillment of their increasing developmental needs for autonomy. Furthermore, research also shows that parents of youth with L-CA tend to experience higher level of distress than parents of youth with A/H-CA (Blatcher, Neece, & Paczkowski, 2005; Hatton & Emerson, 2003; Woolfson & Grant, 2006), making it less likely for them to rely on an authoritative parenting style than parents of youth with A/H-CA (Woolfson & Grant, 2006). These observations suggest that the fulfillment of the basic needs for autonomy may be particularly difficult for adolescents with L-CA.

Finally, research also shows that youth with L-CA are more likely to experience social skills difficulties (Heiman, 2000; Tipton, Christensen, & Blacher, 2013) leading them to experience greater levels of complications in "initiating, establishing, and maintaining friendships" (Gilmore & Cuskelly, 2014, p. 194), higher level of loneliness and social isolation (Gilmore & Cuskelly, 2014), and even high rates of victimization (Maïano et al., 2016). As such, it may be particularly difficult for these adolescents to fulfill their needs for relatedness. Taken together, these observations lead us to expect lower levels of peer group integration among youth with L-CA. Furthermore these observations also suggest possible differential effects of this variable on self-esteem development should youth with L-CA come to attribute a greater level of importance to alternative prosocial relationships with parents and teachers for example. These results reinforce the need to more carefully look at the relations between these critical developmental factors and self-esteem development among youth with L-CA.

The Present Study

The present study aims to provide further insights on the development of self-esteem trajectories within a sample of adolescents with L-CA and matching sample of adolescents with A/H-CA both extracted from a representative sample of Australian adolescents measured annually from Grade 7 to 12. To further document the factors involved in self-esteem development within the matched samples of adolescents with L-CA and A/H-CA, we assess the relations between self-esteem trajectories and a variety of well-documented predictors, including gender, perceived school usefulness and dislike, ratings of maternal and paternal authoritarian and authoritative parenting style, and peer integration.

Method

Sample, Procedure, and Matching

The sample considered in the present study is drawn from the Wollongong Youth Study (WYS), which was conducted in a number of regular secondary schools from the same Catholic Diocese and

located in the regional and metropolitan areas of Wollongong (New South Wales, Australia). In 2003, all adolescents attending grade 7 in the participating schools were targeted for participation in this study and were followed annually thereafter until grade 12. Socioeconomic indicators, such as family occupation, structure, and first language closely match National Australian trends at the time of the study as reported by the Australian Bureau of Statistics (2005) supporting the idea that this sample is representative of the Australian population (e.g., Ciarrochi, Heaven, & Skinner, 2012). This longitudinal study received annual approval from the university ethics committee and Diocesan authorities. Additionally, parents and adolescents also provided informed consent on an annual basis. Students who were not deemed by the schools, or their parents, to possess sufficient reading ability to complete our questionnaires were excluded from this study. Teachers were available in class to help students understand questionnaire items, when necessary. For additional details on WYS, see Ciarrochi et al. (2012) and Heaven, Leeson, and Ciarrochi (2009).

Upon entering secondary schools (in Grade 7), all students were required to complete two standardized measures of verbal and numerical aptitudes. The first test called "English Language and Literacy Assessment (ELLA)" assesses verbal aptitudes in writing, reading, and language, while the second test called "Secondary Numeracy Assessment Program (SNAP)" assesses numeracy aptitudes in number, measurement, space, data, and numeracy problem-solving. Both of these tests are associated with satisfactory levels of scale score reliability, as assessed by Cronbach' alpha coefficient (ELLA: $\alpha = .87$; SNAP: $\alpha = .95$). Although these tests are not specifically designed to assess IQ, similar tests of cognitive aptitudes are known to underpin a common g factor of intelligence (Deary, Strand, Smith, & Fernandes, 2007; Frey & Detterman, 2004). These two tests have been previously found to be significantly related to the abbreviated Wechsler Scale of Intelligence (Heaven, Ciarrochi, & Leeson, 2011), to significantly predict future levels of academic performance (Heaven & Ciarrochi, 2008a), and to represent valid proxy measures of global IQ (Ciarrochi et al., 2012; Heaven & Ciarrochi, 2012; Heaven et al., 2011; also see Weeks et al., 2014). In order to select the subsample of participants with L-CA, we retained all adolescents who scored in the lowest 15% on both the ELLA and SNAP tests. The 15th percentile was selected as the cut-off point as (a) prevalence estimates of students with L-CA in mainstream settings in Australia fall between 12-16% (OCED, 1999), and (b) 15% of the population have an IQ that falls one standard deviation below the mean IQ score (Wechsler et al., 2003).

This resulted into a sample of $N = 138$ (90 boys, 48 girls) L-CA adolescents. These students are best described as performing below or at national minimum standards in literacy and numeracy (Australian Curriculum, Assessment and Reporting Authority, 2015). The higher proportion of males is not surprising as it is well documented that males are more likely to be identified as presenting learning difficulties than females (Australian Bureau of Statistics, 2012; Westwood & Graham, 2000).

Using the matchit package implemented in R (Ho, Imai, King, & Stuart, 2011; R Core Team, 2013), we extracted a matched comparison sample of adolescents with A/H-CA. For purposes of this study, exact matching was conducted on the basis of school, gender, age in grade 7, and first language. In our sample, more participants were in the A/H-CA group than in the L-CA group. To retain as much information as possible, we matched (with replacement) up to six A/H-CA participants to a single comparable L-CA participant. This 6:1 matching resulted in a set of weights that were used in all statistical models so that the sample reflected the matching procedure (Stuart, 2010; Thoemmes & Kim, 2011). The weights are one for all individuals from the L-CA group. Weights for the A/H-CA group are proportional to the number of L-CA individuals to which they were matched. This procedure resulted in a matched sample of N = 556 A/H-CA students (312 boys; 244 girls).

Instruments

Self-Esteem. At each time wave, participants completed the Rosenberg Self-Esteem Inventory (RSEI; Rosenberg, 1965). Participants were asked to indicate their agreement with a series of ten statements such as "I feel that I have a number of good qualities" and "I feel I do not have much to be proud of" using a modified binary forced response scale ("yes" or "no"). The psychometric adequacy of this modified response scale has been demonstrated in previous research (Heaven, Ciarrochi, & Hurrell, 2010; Marshall, Parker, Ciarrochi, & Heaven, 2014). Negatively worded items were reversed-cored so that higher levels on all items reflect higher levels of self-esteem .The reliability of this scale was estimated using the Kuder-Richardson-20 (KR-20) formula for binary items and found to be satisfactory for all time waves: T1: .807; T2: .830; T3: .853; T4: .862; T5: .844; and T6: .869. Highly similar estimates were obtained separately in the L-CA (respectively: .791, .844, .804, .845, .828,

.891) and H/H-CA (.811, .824, .861, .866, .846, .864) groups. At the beginning of the study, the means level of self-esteem based on the average of the binary scored items was .770 (*SD* = .22) on a 0 to 1 scale, corresponding to a high level of self-esteem.

School Attitudes. In Grade 7, two five-item subscales developed by Furnham and Gunter (1989; Vialle, Heaven, & Ciarrochi, 2007) were used to assess adolescents' perceptions of school usefulness (α_{total} = .704; $\alpha_{L\text{-}CA}$ = .696; $\alpha_{A/H\text{-}CA}$ = .705; e.g., "Doing well at school will lead to a better job one day", "In this day and age, one needs to have good education") and negative attitudes toward schooling (α_{total} = .842; $\alpha_{L\text{-}CA}$ = .826; $\alpha_{A/H\text{-}CA}$ = .847; e.g., "For me, school is a waste of time", "For me, school is really just boring"). All items were rated on a five-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). High ratings reflect high levels of school usefulness and negative attitudes toward schooling.

Parental style. Also in Grade 7, adolescents were asked to report on their mothers' and fathers' parenting style using a shortened version of the Parental Authority Questionnaire (PAQ; Buri, 1991; Reitman, Rhode, Hupp, & Altobello, 2002) developed and validated specifically for the WYS (Heaven & Ciarrochi, 2008a, 2008b). Mother and father levels of authoritarian (mother: α_{total} = .996; $\alpha_{L\text{-}CA}$ = .978; $\alpha_{A/H\text{-}CA}$ = .997; Father: α_{total} = .998; $\alpha_{L\text{-}CA}$ = .962; $\alpha_{A/H\text{-}CA}$ = .998; e.g., "My mother/father makes me conform to her/his way"; "My mother/father believes that force should be used to get children to do what they are supposed to") and authoritative (mother: α_{total} = .613; $\alpha_{L\text{-}CA}$ = ..600; $\alpha_{A/H\text{-}CA}$ = .917; Father: α_{total} = .661; $\alpha_{L\text{-}CA}$ = .665; $\alpha_{A/H\text{-}CA}$ = .661; e.g., "There are certain rules in the family and my mother/father discusses with us the need for those rules"; "I know what my mother/father expects of me, but I feel free to talk with her if I think she/he is being unreasonable) parenting were each assessed through identical five-item subscales. These items were all rated on a five-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). So, high levels on the authoritarian and authoritative subscales reflected respectively high levels of authoritarian and authoritative parenting style. The construct validity of the original and shortened PAQ versions has been well established in previous research in relation to a wide variety of covariates based on both parental and adolescents' reports (Heaven & Ciarrochi, 2006, 2008a, 2008b; Reitman et al., 2002; Smetana, 1995).

Peer Group Integration. In Grade 7, adolescents completed a six-item measure (Heaven, Ciarrochi, & Vialle, 2008; Heaven, Ciarrochi, Vialle, & Cechavicuite, 2005) aiming to assess the quality of their peer group integration (α_{total} = .829; $\alpha_{L\text{-}CA}$ = .799; $\alpha_{A/H\text{-}CA}$ = .832; e.g., "I feel I belong to this group", "I don't fit well with them"). All of these items were rated on a five-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Negatively-worded items were reverse-scored prior to the analyses so that high ratings reflect high levels of integration.

Analyses

All analyses were conducted, while incorporating sample weights, using Mplus 7.3 (Muthén & Muthén, 2014) robust weight least-square estimator (WLSMV) to account for the binary response scales used to assess self-esteem (Finney & DiStefano, 2013). In total, 694 participants completed a total of 1212 time-specific questionnaires, with 75% of the participants providing at least 4 out of 6 waves of data. To account for missing responses, models were estimated based on the full available information, based on algorithms implemented in Mplus for WLSMV (Asparouhov & Muthén, 2010).

First, we estimated longitudinal Confirmatory Factor Analytic (CFA) models underlying ratings of self-esteem across both groups of adolescents and each of the six time waves. This multiple-group longitudinal measurement model included a total of 6 factors (one self-esteem factor per time wave) in both groups of adolescents. The models also included a priori correlated uniquenesses between matching indicators utilized at the different time points to reflect the fact that indicators' unique variance emerges in part from shared sources of influences over time (Mitchison et al., 2015). To ensure that the self-esteem measure performed equivalently across groups of participants and time waves, we tested the measurement invariance of the complete CFA model across groups and time points in the following sequence (Millsap, 2011; Morin, Moullec et al., 2011): (i) configural invariance (the same measurement model is estimated across groups and time points, with no equality constraint), (ii) strong invariance (the factor loadings and item thresholds, which replace the intercepts in WLSMV estimation, are invariant across groups and time points); (iii) strict invariance (the factor loadings, item thresholds, and item uniquenesses are invariant across groups and time points). It should be noted that it is not possible to separately test the invariance of factor loadings (weak invariance) and item thresholds (strong invariance) with models based on binary indicators.

The measurement part of latent growth models (LGM; Bollen & Curran, 2006) used for our main

analyses relies on latent factors representing the time-specific ratings of self-esteem specified as invariant (equivalent) across groups and time based on the results from the preliminary CFA models. LGM relied on the estimation of the intercepts, linear, and quadratic (i.e., curvilinear) slopes of individual trajectories in order to reflect possible non-linear growth patterns in both groups of adolescents (e.g., Diallo, Morin, & Parker, 2014). In this model, time was coded in unit increments (0 to 5) to reflect the one year intervals between the six repeated measures. This approach provides a direct estimate of the average growth trajectory in both groups of adolescents. Since these intercepts and slopes factors are specified as random, they can vary across participants, allowing for the incorporation of predictors of growth. Additional details on technical specifications of these LGM models are provided in the online supplements. In order to assess whether the growth function generalized across groups of adolescents (Kim & Wilson, 2014a, 2014b), equality constraints were progressively integrated across groups on the: (i) mean of the growth factors reflecting the average growth trajectories in each group; (ii) variance of the growth factors, reflecting inter-individual deviations around the mean growth trajectories in each group; (iii) covariance of the growth factors, reflecting the degree to which the growth factors are inter-related within each group; (iv) time-specific residuals reflecting inter-individual deviations from the model-estimated quadratic trajectories.

Predictors were then incorporated and allowed influence the growth factors separately in both groups. The equivalence of these predictions across groups was verified through the integration of equality constraints across groups on these predictions. Because of the complexity of the LGM estimated in relation to the limited sample size in the L-CA subgroup, these predictors were: (i) represented as factor scores saved from invariant measurement models reported in the online supplements (Morin, Boudrias, Marsh, Madore, & Desrumaux, 2016); (ii) integrated in two separate predictive models (Model 1: gender, school usefulness, negative attitudes toward schooling, and peer group integration; Model 2: mother and father authoritarian and authoritative parenting style).

For all models, model fit was evaluated using typical indicators (Hu & Bentler, 1999; Yu, 2002): (a) the chi-square statistic (χ^2), (b) the Comparative fit index (CFI), (c) the Tucker-Lewis index (TLI), and (d) the root mean square error of approximation (RMSEA) and its 90% confidence intervals. Values greater than .90 and. 95 for the CFI and TLI respectively reflect adequate and excellent fit, while values smaller than .08 or .06 for the RMSEA respectively indicate acceptable and excellent fit. For the comparison of models, we examined changes in these fit indices, based on the recommended guidelines (Chen, 2007; Cheung & Rensvold, 2002) that a more constrained (or invariant) model can be considered as providing an equivalent fit than a less constrained model when it is accompanied by CFI or TLI decline of .01 or less and by a RMSEA increase of .015 or less.

Results

The goodness-of-fit results for all models estimated in this study are reported in Table 1. These results show that the preliminary multiple-group longitudinal measurement models underlying L-CA and A/H-CA adolescents responses to the self-esteem inventory provided excellent fit to the data according to the CFI, TLI, and RMSEA, and were strictly invariant across groups and time (ΔCFI and ΔTLI $\leq$ .01; ΔRMSEA $\leq$ .015). Starting from this model of strict invariance, we first estimated a quadratic LGM freely across both subgroups of adolescents, and then progressively added equality constraints on the LGM model parameters across subgroups of participants. The goodness-of-fit results showed that this model provided an excellent level of fit to the data, and was fully equivalent across groups of adolescents with L-CA and A/H-CA (ΔCFI and ΔTLI $\leq$ .01; ΔRMSEA $\leq$ .015).

The parameter estimates from this fully invariant quadratic LGM model are reported in Table 2, and the average trajectory is graphically depicted in Figure 1. These results reveal that the mean intercept factor is significant, but that the mean linear and quadratic slope factors are both non-significant, suggesting that self-esteem levels remain relatively high and stable over the course of adolescence. The variance parameters associated with these growth factors showed significant inter-individual variability, suggesting that individual trajectories significantly differ from one another around the estimated average-stable trajectory. Standardized correlations estimated between these three growth factors reveal a significant and strong negative correlation between the linear and quadratic growth factors, suggesting that adolescents with more pronounced linear increases over time tended to present less pronounced quadratic, or curvilinear, trajectories. Finally, examination of the time specific residuals suggest that the growth factors tended to provide a reasonably satisfactory depiction of the repeated self-esteem measures, corresponding to percentage of explained variance (R^2 x100 or 1-standardized residuals x 100) varying from 54.2% (Grade 8) to 87.2% (Grade 12).

Predictors where then incorporated to this fully invariant LGM model. As shown in Table 1, these predictions were found to be equivalent across subgroups of adolescents with L-CA and A/H-CA. The detailed results from these models are reported in Table 3. These results first show significant associations between gender and all of the growth factors, suggesting that girls tend to present lower levels of self-esteem than boys in Grade 7 (corresponding to a difference of .32 SD[1]), a less pronounced linear increase over time, and a more pronounced quadratic trend over time. Gender-specific growth trajectories are graphically represented in Figure 1, revealing that boys trajectories are characterized by a higher than average level of self-esteem that remain relatively stable over time (i.e., boys average linear and quadratic slopes are both non-significant). In contrast, girls initially present lower than average self-esteem levels that tend to decrease over time until Grade 9-10 (the decrease occurring between Grade 7 and 10 corresponds to about .30 SD, leading girls to present self-esteem levels .78 SD lower than those of boys in Grade 10), and then to increase again between Grade 10 and 12 (the decrease occurring between Grade 10 and 12 corresponds to about 32 SD, leading girls to present self-esteem levels .45 SD lower than those of boys in Grade 12). Perhaps not surprisingly given that all predictors were measured in Grade 7, the effects of all remaining predictors are limited to the intercept factor, suggesting that lower levels of negative attitudes toward schooling, higher levels of mother and father authoritative style, lower levels of mother authoritarian style, and higher levels of peer group integration all predicted higher levels of self-esteem. In contrast, perceived school usefulness and father authoritarian parenting style did not significantly predict self-esteem trajectories.

Discussion

Interest in, and concerns about, the self-esteem development of adolescents with L-CA has permeated research, policy and service delivery for many decades and across many countries (WHOQOL Group, 1995). This extensive investment, however, has been undermined by the inadequate research designs and measurement rigor employed in prior studies. To date, the research literature has adopted cross-sectional designs with small samples sizes and inadequate measurement tools (e.g., Tracey et al., 2015) to identify the level of self-esteem experienced by adolescents with L-CA which contributes little to understanding developmental trajectories or advising how best to cultivate positive self-esteem among these adolescents (e.g., Llewellyn, 2014). This study aimed to investigate the long-term development of self-esteem across six time waves during secondary school and to contrast these developmental trajectories across matched samples of adolescents with L-CA and A/H-CA. Importantly, this study also endeavored to gain insight into key social determinants of self-esteem in order to assess whether the relationships between these determinants and self-esteem trajectories generalized across matched samples of adolescents with L-CA and A/H-CA.

The findings show that youth with L-CA experience on average similar self-esteem trajectories than their peers with A/H-CA. The disability rights movement has campaigned for persons with various forms of disabilities to be recognized as a person first and by their disability second, highlighting that there are more similarities than differences between people with and without disabilities (Blaska, 1993). By applying an advanced research design (i.e., a multiple group approach to the estimation of conditional LGM analyses across two matched subgroups of adolescents), our study empirically supports the notion that developmental trajectories of self-esteem are more similar than dissimilar for adolescents with L-CA and A/H-CA. Furthermore, these results are in line with prior research in showing that, on average, self-esteem levels remain high and stable in adolescence (Morin, Maïano, et al., 2011). However, our results show substantial gender differences in self-esteem trajectories that appears to apply equally to youth with L-CA and with A/H-CA. This result is well aligned with numerous studies that have highlighted boys' advantage in terms of presenting higher levels of self-esteem in adolescence (Diseth et al., 2014; Steiger et al., 2014). Correspondingly, this study also revealed higher baseline levels of self-esteem for boys that remain relatively stable over time. In contrast, girls' levels of self-esteem were lower than average in Grade 7 and decreased until mid-adolescence (Grade 10), before increasing back but never reaching a level comparable to that of boys. This might possibly reflect a greater level of sensitivity to the multiple biological and social changes occurring over the course of adolescence among girls (e.g., Morin et al., 2011).

From a theoretical perspective, stage-environment fit (e.g., Eccles et al. 1993) and self-determination (e.g., Ryan & Deci, 2000) theories both reinforce the importance of the school, peer,

[1] Because the growth model relies on latent factors (rather than scale scores), SD are a more natural unit to use in these comparisons.

and familial contexts in fulfilling adolescents' basic needs for competence, autonomy, and relatedness, whereas the sociometer theory (e.g., Leary, 2008) positions self-esteem as a core component of the relational self-monitoring system. Adopting these theoretical perspective, the present study focused on the role of perceived school usefulness and negative school attitudes (as a key determinants of the satisfaction of the need for competence), parental reliance on authoritative and authoritarian parenting practices (as key determinants of the satisfaction of the need for autonomy), and peer group integration (as a key determinant of the satisfaction of the need for relatedness) on the self-esteem trajectories of youth with L-CA and A/H-CA. In particular, previous research conducted among youth with L-CA suggested that it may be harder for them to reach a state of fulfillment of their basic needs for competence, autonomy, and relatedness given their greater risk of experiencing academic (Craven et al., 2015), or social skills (Gilmore & Cuskelly, 2014; Heiman, 2000; Tipton et al., 2013) deficits, possibly even leading them to develop alternative definitions of success (e.g., Weeks et al., 2014). In this regard, it is interesting to note that, perhaps despite these greater levels of difficulties, the results in terms of self-esteem prediction were found to be identical among youth with L-CA as among their peers with A/H-CA. As such, our findings offer specific solutions for a vulnerable group of adolescents rather than merely identifying the presence of various well-documented social and academic difficulties (Llewellyn, 2014), providing valuable insights for researchers, educators, families and policy makers who are seeking to maximize self-esteem among vulnerable populations (for example of self-esteem enhancement interventions, see Haney & Durlak,1998).

Previous studies have generally highlighted the relevance of school as an important life domain for adolescents in general (e.g., Arens et al., 2013; Huebner & Gilman, 2006). In line with these previous studies, the current results support the idea that higher levels of school dislike were negatively related to self-esteem levels. In contrast, our results failed to show any significant relations between adolescents' levels of perceived school usefulness, and their levels of self-esteem. These results suggest that, at least within this specific developmental period characterized by mandatory education, it appears far more important to prevent the development of negative attitudes toward school than to encourage the development of a strong sense of perceived school usefulness. As others have argued before, in adolescence, school represents far more than a simple "academic" learning environment, but rather a complex life context in which youth implicitly and explicitly learn about themselves and social relationships (e.g., Eccles et al., 1993; Morin et al., 2013). Given that schools are an inherent, and mandatory, part of youth daily lives, it makes sense that it is far more critical to avoid the development of negative feelings toward this critical life context, rather than to simply focus on nurturing perceptions that the academic objectives of schooling will be useful in later life. Obviously, this result is likely to change importantly in later adolescence years and early adulthood, as school becomes a more systematic and self-selected professional training ground.

Previous research have demonstrated the importance of parental practices, especially those that contribute to the development of greater levels of autonomy, in terms of encouraging positive self-esteem development during adolescence (e.g., Arbona & Power, 2003; Laible et al., 2004; Milevsky et al., 2007). In line with these previous results, the present study demonstrates the importance, for both mothers and fathers, of relying on authoritative parenting practices in order to encourage self-esteem development in adolescents. Also supporting the results from previous studies, our results further show that mother's reliance on a more authoritarian parenting style leaving less room for adolescents autonomy, was negatively related to self-esteem levels. In contrast, father's reliance on more authoritarian practices did not predict self-esteem development, consistent with the observation that mothers and fathers are likely to play different, and complementary, roles in adolescents self-esteem development (e.g., Laible & Carlo, 2004; Milevsky et al., 2007). Unfortunately mothers still tend to be more involved than fathers in youth development, which may explain why their parenting practices, especially those tending to curb the development of autonomy, may play a more substantial role in adolescents' self-esteem development (Acock & Demo, 1994; Ishii-Kuntz, 1994; McBride & Mills, 1993). These findings highlight the importance of considering mothers and fathers separately in studies of parental influences on youth development (Milevsky et al., 2007). Perhaps even more importantly, these findings also suggest the importance of encouraging youth to develop their sense of autonomy in a supportive and proactive manner, particularly in populations with L-CA that tend to present greater levels of dependency on their parents (e.g., Wehmeyer, 2005).

Finally, prior research has demonstrated the relevance of positive peer-related experiences and peer group integration for the establishment of high and stable levels of self-esteem (e.g., Gorrese, &

Ruggieri, 2013; Laible et al., 2004; Morin et al., 2013). Replicating these findings, the present study also demonstrates a positive relation between peer group integration and self-esteem, and found this relation to be equally important for youth with L-CA as for those with A/H-CA. Hence, adolescents' feeling of being accepted within their peer group contributes to higher self-esteem, and needs to be supported by the school system, particularly for youth with L-CA who tend to present more difficulties in this area (e.g., Gilmore & Cuskelly, 2014; Maïano et al., 2016).

Altogether, our results suggest that researchers and practitioners working to support adolescents with L-CA should be prepared to witness, and respond to, similar developmental trends as would be expected from their peers with A/H-CA. In order to maximize self-esteem, the findings emphasize where resources should be directed. Self-esteem enhancement strategies occurring within the school context should seek to enhance adolescents' enjoyment of school, rather than their perceptions of the utility of schooling, and aim to encourage acceptance and positive participation with the peer group. Furthermore, mothers and fathers should receive support in the adoption of a more authoritative parenting style. This appears to be particularly important for families where an adolescent presents L-CA given that previous research demonstrates that these parents tend to experience greater levels of distress (Blatcher et al., 2005; Hatton & Emerson, 2003) and were less likely to use more authoritative parenting styles (Woolfson & Grant, 2006). Given the reported differences between boys and girls, strategies and resources should pay particular attention to girls not only in their adolescent years, but also in earlier years to prevent the emergence of this disadvantage as they move into adolescence. In practice, these findings imply that the same approaches for self-esteem can be applied to and might be similarly effective for a wide range of adolescents irrespective of their level of cognitive ability.

It should be kept in mind that the current study faces shortcomings which should be addressed in future studies and may limit the generalizability of the obtained results. First, the present study relies on a process of secondary data analysis of a large longitudinal data set not initially collected to focus on youth with L-CA. As such, some information is lacking and might have helped to better contextualize our results. Thus, previous research has identified that the type of educational placement experienced by adolescents with L-CA is an important contextual factor impacting upon their development (e.g., Cadieux, 2003; Tracey, Marsh, & Craven, 2003). The WYS, which provided the sample for this study, did not collect information about the adolescents' type of educational placement and did not include specialized establishments, which means that all participants were either integrated in a regular class, or in a self-contained class for students with special needs. This clearly limits our ability to consider the impact of this important school context, as well as the lowest levels of cognitive functioning, which may have limited our ability to detect significant differences between students with L-CA and A/H-CA. Similarly, the current project adopted a non-categorical approach focusing on student's level of cognitive functioning rather than focusing on the etiology of their cognitive difficulties (e.g., Autism, Down syndrome). Still, information about specific developmental disabilities, had such information been available, might have provided us with a more nuanced understanding of self-esteem development for these students. In addition, students' cognitive abilities were assessed through a standardized national test of literacy and numeracy. Despite evidence, previously presented, that this test provides a highly reliable proxy for IQ, they remain, at best, an indirect measure of IQ and cognitive functioning. As such, future research would do well to more carefully consider the relations between the type of school placements, diagnoses of developmental disabilities and cognitive levels as assessed through formal standardized IQ tests on the present results.

Second, self-esteem and self-concept are used interchangeably in the reviewed research literature. The authors, however, view these as distinct. Self-esteem is a unidimensional construct whereas self-concept is multidimensional and more pliable to experience and feedback (Marsh & Craven, 2006). Future studies should be encouraged to more carefully consider the development of multidimensional self-concept in order to gain greater insight into the academic and nonacademic identities that are largely hidden when self-esteem is measured as a global construct. This differentiation is even more pertinent for adolescents with L-CA, who tend to experience more negative feedback and experiences regarding their academic competence, or who may experience greater levels of social difficulties (Tracey, 2012). For these adolescents, alternative models of self-evaluation and self-valorization, such as those focusing on sport competence, may be particularly relevant.

Finally, it should be mentioned that the various predictors considered in this study, with the exception of gender, were only related to the baseline level of self-esteem but not to self-esteem growth over time. These findings suggest that school-related and social variables account for

adolescents' differences in self-esteem levels during the time period covered in the present study. Given that these predictors were only measured as part of the baseline assessment, this should not come as a surprise, but remains a key limitation of the present study. Similarly, although the present study focused on core facets of adolescents' school, family, and peer experiences, each of these specific set of experiences encompasses a broader range of characteristics than those covered in this study. Future research would do well to complement the present findings with a more comprehensive coverage of additional characteristics of these various life domains (e.g., parental permissiveness, positive relationships with teachers, bullying, romantic involvement). Studies conducted with samples of younger adolescents might afford further insight into the influences the various predictor variables might play in the formation and development of self-esteem trajectories and potential differences between L-CA and A/H-CA adolescents through the consideration of time-varying predictors.

In sum, this study offers new and interesting insights into self-esteem development and determination among youth with L-CA and A/H-CA. The study advances the methodology utilized in this research field by adopting a sophisticated long-term design including six measurement waves and various predictor variables targeting school, peers, and parents. Importantly, the findings offer tangible recommendations for practice, based on empirical evidence, about how best to maximize self-esteem and reduce the disadvantage already confronting this vulnerable group of adolescents.

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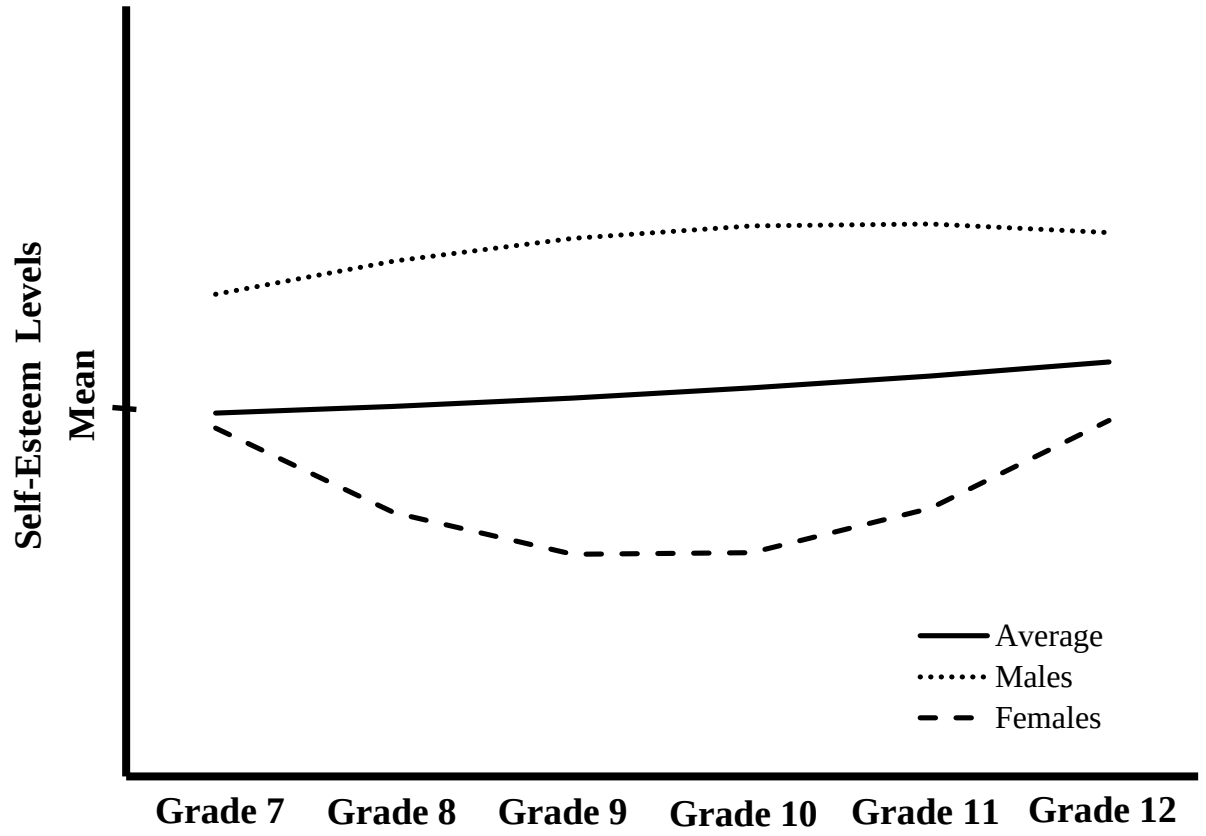

Figure 1. Self-Esteem Trajectories

Note. Self-esteem levels are estimated from latent factors estimated from binary items, and thus not expressed in any meaningful unit. All deviations around the average trajectories are captured within less than .5 SD.

Table 1

Goodness-of-Fit Results for All Models Estimated in this Study.

	χ^2	df	CFI	TLI	RMSEA	RMSEA 90%CI
Multiple-Group Longitudinal Measurement Model						
1 Configural invariance	4847.485	4578	.974	.971	.013	[.008; .017]
2 Strong invariance (Loadings, thresholds) across groups and time points	4960.987	4688	.974	.972	.013	[.008; .017]
3 Strict invariance (Loadings, thresholds, uniquenesses) across groups and time points	5103.709	4820	.973	.971	.013	[.008; .017]
Quadratic Latent Growth Models (Starting from Model 3)						
4 Free estimation across groups	5166.277	4844	.969	.968	.014	[.010; .017]
5 Invariance of the growth factors means across groups	5181.199	4847	.968	.967	.014	[.010; .017]
6 Invariance of the growth factors means and variances across groups	5181.182	4850	.969	.967	.014	[.010; .017]
7 Invariance of the growth factors means, variances, and covariances across groups	5179.161	4853	.969	.967	.014	[.010; .017]
8 Invariance of the growth factors means, variances, covariances, and time-specific residuals across groups	5180.743	4859	.969	.968	.014	[.010; .017]
Quadratic Latent Growth Models with Predictors (Starting from Model 8)						
9 Predictors (Gender, school usefulness, negative attitudes toward schooling, peer group integration) freely estimated across groups	5943.195	5396	.956	.953	.017	[.014; .020]
10 Predictors (Gender, school usefulness, negative attitudes toward schooling, peer group integration) invariant across groups	5998.342	5408	.952	.950	.018	[.015; .020]
11 Predictors (authoritarian and authoritative parenting style) freely estimated across groups	5984.678	5396	.955	.953	.018	[.015; .020]
12 Predictors (authoritarian and authoritative parenting style) invariant across groups	5991.548	5408	.956	.953	.018	[.015; .020]

Note. *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = confidence interval; all χ^2 values are significantly significant at $p \leq .01$.

Table 2

Parameter Estimates from the Final Retained Fully Invariant Quadratic Latent Growth Model (Model 8).

Growth Parameters	Intercept factor		Linear slope factor		Quadratic slope factor	
Mean	2.680 (0.211)**		0.018 (0.074)		0.003 (0.016)	
Variance	1.859 (0.519)**		0.736 (0.273)**		0.033 (0.010)**	
Standardized Correlations	Intercept factor		Linear slope factor		Quadratic slope factor	
Linear slope factor	-0.276 (0.168)					
Quadratic slope factor	0.285 (0.132)		-0.941 (0.017)**			
Repeated measures	Grade 7 (Time 1)	Grade 8 (Time 2)	Grade 9 (Time 3)	Grade 10 (Time 4)	Grade 11 (Time 5)	Grade 12 (Time 6)
Standardized Residuals	0.157 (0.154)	0.458 (0.047)**	0.195 (0.061)*	0.262 (0.038)**	0.255 (0.051)**	0.124 (0.106)

Note. * $p \leq .05$; ** $p \leq .01$; All parameter estimates are equivalent for groups of adolescents with average to high levels of cognitive abilities and low levels of cognitive abilities; Standard errors of the coefficients are reported in parentheses.

Table 3.

Path Coefficients for the Invariant Relations between the Predictors and the Growth Factors (Models 10 and 12)

	Intercept factor		Linear slope factor		Quadratic slope factor	
Predictors	*b* (SE)	β (SE)	*b* (SE)	β (SE)	*b* (SE)	β (SE)
Gender	-0.434 (0.144)**	-0.184 (0.062) **	-0.470 (0.138)**	-0.321 (0.106)**	0.087 (0.030)**	0.278 (0.099)**
School usefulness	-0.045 (0.094)	-0.030 (0.062)	-0.124 (0.098)	-0.132 (0.106)	0.034 (0.023)	0.169 (0.116)
Negative school attitudes	-0.315 (0.096)**	-0.227 (0.074) **	0.005 (0.091)	0.006 (0.106)	-0.001 (0.022)	-0.004 (0.119)
Peer group integration	0.326 (0.087)**	0.234 (0.064)**	0.076 (0.083)	0.088 (0.097)	-0.018 (0.020)	-0.097 (0.108)
Mother-authoritarian style	-0.339 (0.145)*	-0.213 (0.092)*	-0.028 (0.147)	-0.030 (0.156)	0.028 (0.034)	0.137 (0.159)
Mother-authoritative style	0.263 (0.130)*	0.165 (0.086)*	-0.084 (0.133)	-0.089 (0.146)	0.022 (0.029)	0.106 (0.144)
Father-authoritarian style	-0.118 (0.129)	-0.079 (0.087)	0.139 (0.148)	0.157 (0.168)	-0.056 (0.037)	-0.289 (0.179)
Father-authoritative style	0.246 (0.125)*	0.158 (0.080)*	0.013 (0.138)	0.014 (0.151)	-0.010 (0.033)	-0.052 (0.164)

Note. * $p \leq .05$; ** $p \leq .01$; All parameter estimates are equivalent for groups of adolescents with average to high levels of cognitive abilities and low levels of cognitive abilities; Gender is coded 0 = boys, 1 = girls; *b* = unstandardized regression coefficients; β = standardized regression coefficients; SE = standard errors of the coefficients.

Online Supplements for:

Self-Esteem Trajectories and their Social Determinants in Adolescents with Different Levels of Cognitive Ability

Appendix A. Formal Specification of the Latent Growth Models.

In this study, we estimated a quadratic growth model (see Figure S1) for y_{itg}, corresponding to latent self-esteem factors estimated at six measurement occasions within two distinct groups of participants, where *i* is the index for individual, *t* is the index for time, and *g* is the index for the group.

$$y_{itg} = \alpha_{iyg} + \beta_{1iyg}\lambda_t + \beta_{2iyg}\lambda^2{}_t + \varepsilon_{yitg} \quad (1)$$

$$\alpha_{iyg} = \mu_{\alpha yg} + \zeta_{\alpha yig} \quad (2)$$

$$\beta_{1iyg} = \mu_{\beta 1yg} + \zeta_{\beta 1yig} \quad (3)$$

$$\beta_{2iyg} = \mu_{\beta 2yg} + \zeta_{\beta 2yig} \quad (4)$$

Where α_{iyg}, β_{1iyg} and β_{2iyg} respectively represent the random intercept, random linear slope and random quadratic slope of the trajectory for individual *i*, ε_{yit} represents the time- individual-specific errors; $\mu_{\alpha yg}$, $\mu_{\beta 1yg}$ and $\mu_{\beta 2yg}$ represent the average intercept, linear slope and quadratic slope; and $\zeta_{\alpha yig}$, $\zeta_{\beta 1yig}$ and $\zeta_{\beta 2yig}$ reflect the variability of the estimated intercepts and slopes across participants. These disturbances have a mean of zero and a variance-covariance matrix Φ_{yg}:

$$\Phi_{yg} = \begin{bmatrix} \psi_{\alpha\alpha yg} & & \\ \psi_{\alpha\beta 1yg} & \psi_{\beta 1\beta 1yg} & \\ \psi_{\alpha\beta 2yg} & \psi_{\beta 1\beta 2y}g & \psi_{\beta 2\beta 2yg} \end{bmatrix} \quad (5)$$

In all of these equations, the *g* subscript indicates that the parameter estimates may differ across groups. Errors (ε_{yitg}) are generally assumed to have a mean of 0 and to be uncorrelated over time, across cases or with the other model parameters. Most models assume that all cases have the same error variance for each time period but allow these errors to vary across periods. Time is indicated by λ_t, which represents the loadings of the time-specific measurement points on the slope factor and is coded to reflect the intervals between measurement points. In this study including six equally spaced measurement points and in which it is appropriate to estimate the intercepts at Time 1 (reflecting the beginning of secondary school [$E(\alpha_{iyg}) = \mu_{y1g}$], such that λ_t is coded $\lambda_1 = 0$, $\lambda_2 = 1$, $\lambda_3 = 2$, $\lambda_4 = 3$, $\lambda_5 = 4$, and $\lambda_6 = 5$. Finally, these models allow the inclusion of predictors of the growth factors.

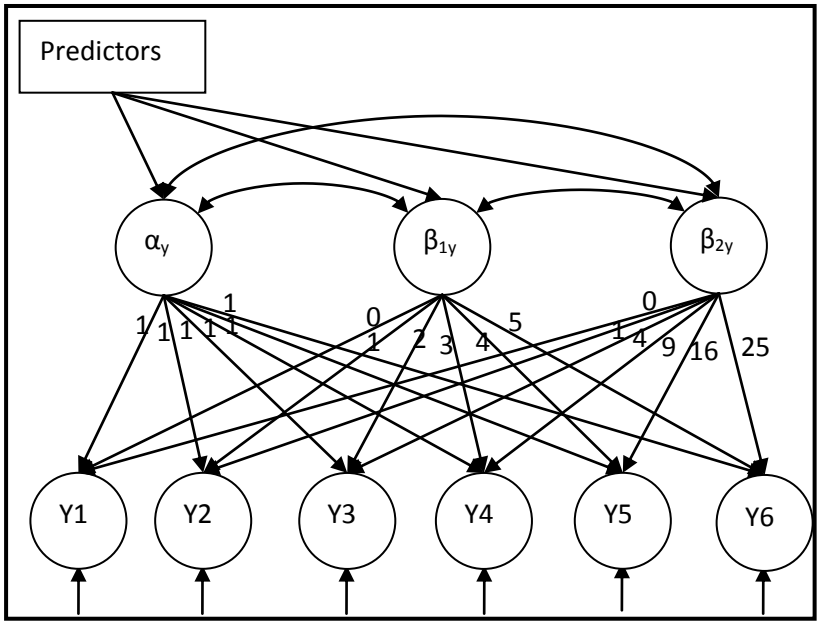

Figure S1. Quadratic Latent Growth Model Estimated in this Study.

Appendix B. Preliminary Measurement Models Estimated for the Predictors.

Following similar estimation procedures and interpretation guidelines as those described in the main manuscript, we estimated a multiple-group measurement model including all predictor variables (i.e., school usefulness, negative attitudes toward schooling, peer group integration, and parenting [Mother authoritarian; mother authoritative; father authoritarian; father authoritative]). These measurement models were estimated using exploratory structural equation modeling (ESEM; Asparouhov & Muthén, 2009; Marsh, Morin, Parker, & Kaur, 2014; Morin, Marsh, & Nagengast, 2013). ESEM offers the possibility to integrate features of CFA, structural equation modeling (SEM), and exploratory factor analysis (EFA) in a single framework. This decision is based on the results from simulation studies (Asparouhov & Muthén, 2009; Sass & Schmitt, 2010; Schmitt & Sass, 2011) and studies of simulated data (Marsh, Lüdtke, Nagengast, Morin, & Von Davier, 2013; Morin, Arens, & Marsh, 2016) showing that forcing cross-loadings (even as small as .100, Marsh et al., 2013) present in the population model to be exactly zero according to typical CFA specification forces these cross-loadings to be expressed through an inflation of the factor correlations. In contrast, these same studies show that the free estimation of cross-loadings, even when none are present in the population model, still provides unbiased estimates of the factor correlations (also see Asparouhov, Muthén, & Morin, 2015; Morin, Arens, & Marsh, 2016).

This overall measurement model included a first set of three correlated factors, representing school usefulness, negative attitudes toward schooling, and peer group integration. These three factors were specified according to typical CFA specifications with no cross-loading or correlated uniquenesses. The remaining four factors reflecting parenting style (mother-authoritative; father-authoritative; mother- authoritarian; father-authoritarian) were specified as correlated EFA factors, with all cross-loadings freely estimated in order to allow for an explicit representation of construct-relevant multidimensionality related to the assessment of conceptually similar constructs (Morin, Arens, & Marsh, 2016; Morin, Arens, Tran, & Caci, 2016). These factors were estimated using an oblique target rotation (Browne, 2001), allowing for the pre-specification of target and non-target loadings in a confirmatory manner. All cross-loadings were "targeted" to be close to zero, while all of the main loadings were freely estimated. These factors also included a priori correlated uniquenesses between the parallel-worded items used to assess mother and father parenting style (Morin, Arens, & Marsh, 2016; Simons & Conger, 2007).

The results from tests of multiple group invariance conducted on this model are reported in Table S1 of these online supplements. The results first show that the model of configural invariance provided an acceptable level of fit to the data according to the CFI and TLI, and an excellent level of fit to the data according to the RMSEA. Adding invariance constraints on the factor loadings and item intercepts never resulted in a decrease in fit exceeding the recommended guidelines, thus supporting the strong invariance of the model. However, imposing equality constraints on the items' uniquenesses resulted in a more substantial decrease in model fit (ΔCFI and ΔTLI = .03), thus failing to support the strict invariance of the model. However, inspection of the parameter estimates of the model of strong invariance and of the modification indices associated with the model of strict invariance suggested that only a few item uniquenesses (7 out of 36) appeared to be non-invariant, suggesting a slightly higher level of measurement error in the L-CA group. A model of partial strict invariance was thus estimated, and resulted in a level of fit to the data identical to the model of strong invariance, thus supporting the partial strict invariance of the model. From this model, invariance constraints were then progressively added on the correlated uniqueness, latent variances and covariances, and latent means. These additional models all resulted in an identical level of fit to the data than the model of partial strict invariance, thus supporting the complete invariance of the model across both subgroups of adolescents. Factors scores of these predictors to be used in the predictive analyses reported in the main manuscript were saved from this model of complete invariance, ensuring the complete comparability of the scores on these variables across subgroups.

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Table S1

Goodness-of-fit Indices of the Measurement Model including Predictor Variables [School usefulness, negative attitudes toward schooling, peer group integration, and parenting (Mother authoritarian; mother authoritative; father authoritarian; father authoritative)].

	χ^2	df	CFI	TLI	RMSEA	RMSEA 90% CI
Configural invariance	1535.96	1091	.91	.90	.04	[.03; .04]
Weak invariance (loadings)	1554.29	1133	.92	.91	.04	[.03; .04]
Strong invariance (loadings, intercepts)	1621.15	1162	.91	.90	.04	[.03; .04]
Strict invariance (loadings, intercepts, uniquenesses)	1802.44	1198	.88	.87	.04	[.04; .05]
Partial strict invariance (loadings, intercepts, partial uniquenesses)	1676.43	1191	.90	.90	.04	[.03; .04]
Invariance of the correlated uniquenesses (loadings, intercepts, partial uniquenesses, correlated uniquenesses)	1697.76	1204	.90	.90	.04	[.03; .04]
Invariance of the latent variance-covariance (loadings, intercepts, partial uniquenesses, correlated uniquenesses, latent variances and covariances)	1724.17	1232	.90	.90	.04	[.03; .04]
Latent mean invariance (loadings, intercepts, partial uniquenesses, correlated uniquenesses, latent variances and covariances, latent means)	1742.80	1239	.90	.90	.04	[.03; .04]

Note. df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = confidence interval.