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Short- and Long-Term Effects of Over-Reporting of Grades on Academic Self-Concept and Achievement

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Abstract

This study examined the short- and long-term effects of self-enhancement (i.e., over-reporting of academic grades) on academic self-concept and academic achievement. A total of 916, 719, and 647 students participated in the first, second, and third waves of assessment, respectively (mean age at T1 = 15.6 years). At each assessment, students reported their last mid-term grades and their self-concepts in mathematics, German, English, and French. Actual mid-term grades were obtained from the school administrations. Results showed that self-enhancement was positively associated with self-concept in the short term. However, in the long term, self-enhancement was directly associated with stronger decreases in self-concept and indirectly with stronger decreases in achievement that were linked to inflated self-concepts. Implications for research and educational practice are discussed.

Keywords: Self-enhancement, academic self-concept, academic achievement, longitudinal data.

Public Significance Statement

This study showed that students reporting higher grades than they actually received showed better academic self-concepts. However, these higher levels of academic self-concept were in turn linked with stronger declines in academic achievement across high school. These results suggest that students who over-report their grades might tend to underestimate the commitment they need to maintain their level of achievement, which might put them at risk of decreased achievement over time.

Short- and Long-Term Effects of Over-Reporting of Grades on Academic Self-Concept and Achievement

A number of studies from different research fields have shown that there is a tendency to portray oneself as above average with respect to many individual characteristics such as driving skills (Svenson, 1981), relationship quality (Rusbult, Van Lange, Wildschut, Yovetich, & Verette, 2000), well-being (Goetz, Ehret, Jullien, & Hall, 2006; Wojcik & Ditto, 2014), and intelligence (Brown, 2012). This tendency is generally known as the *better-than-average effect* and is motivated by self-enhancement mechanisms (Alicke, 1985; Brown, 1986). Sedikides and Strube (1997) defined self-enhancement as "both the attempts to increase the positivity of one's self-concept (i.e., self-advancing) and attempts to diminish the negativity of one's self-concept" (i.e., self-protecting; p. 147). Self-enhancement takes on very different forms that have been described along several bipolar dimensions (Sedikides & Gregg, 2008) such as *public versus private* (i.e., towards others versus oneself), *candid versus tactical* (i.e., based on opportunity or planned), and *relevant versus irrelevant* (i.e., in domains that are relevant or irrelevant for one's self-evaluation).

The conceptual opposite of self-enhancement is self-handicapping. Self-handicapping involves erecting performance-inhibiting barriers to either protect self-image following failure (i.e., discounting) or enhance one's self-image following success in very challenging situations (i.e., augmenting; Rhodewalt, Morf, Hazlett, & Fairfield, 1991). While self-enhancement is expected to increase long-term engagement and persistence in an activity (Taylor & Brown, 1994), self-handicapping might put students at risk of decreased performance in the long run (Schwinger, Wirthwein, Lemmer, & Steinmayr, 2014) even though they might be able to maintain a stable self-view in the short term (McCrea & Hirt, 2001), which shows that a short-term effect of self-handicapping might actually be self-enhancement (in one of its forms; i.e., maintaining a stable self-concept). Thus, both self-

enhancement and self-handicapping are aimed at optimizing/maintaining one's self-view, but their long-term effects on achievement might be different. The present study examined the short- and long-term effects of self-enhancement on academic self-concept and achievement.

The *relevant versus irrelevant* dichotomy of self-enhancement highlights how self-enhancement is highest with respect to personal characteristics that individuals consider to be important (Brown, 2012). In the academic context, one important personal characteristic is academic achievement,[1] which we consider a latent construct typically manifested in numerical and letter grades. Achievement is often measured using exams, presentations, and other forms of academic assessment at various points through the semester or school year. Grades are a very salient and institutionalized form of feedback; thus, from the students' perspective, grades can be a meaningful source of information from which their achievement can be inferred (Pekrun, Hall, Goetz, & Perry, 2014). As such, grades can exert a direct influence on students' academic self-concept[2] (Niepel, Brunner, & Preckel, 2014; Preckel, Niepel, Schneider, & Brunner, 2013) and self-evaluation (Crocker, Karpinski, Quinn, & Chase, 2003).

Given the subjective relevance of academic grades and the tendency to self-enhance when reporting on important personal characteristics (Brown, 2012), it is not surprising that a general propensity to over-report past grades has been observed in many studies. Kuncel, Credé, and Thomas (2005) reviewed the existing research on the inaccuracy of self-reported grade point averages (GPA) and carried out a meta-analysis of 37 independent samples encompassing a total of 60,926 individuals. The authors found that students tend to over-report their GPA, and that the percentage of students over-reporting their GPA is three to four

[1] Unless otherwise indicated, the term "achievement" will be used to indicate academic achievement for the remainder of the paper.

[2] Similarly, the term "self-concept" will be used to indicate academic self-concept for the remainder of the paper.

times higher than the percentage who under-report. Studies on the validity of self-reported grades that were carried out after the meta-analysis by Kuncel et al. largely confirmed these findings (Dickhäuser & Plenter, 2005; Gramzow & Willard, 2006; Möller, Streblow, Pohlmann, & Köller, 2006; Schneider & Sparfeldt, 2016; Schwartz & Beaver, 2014; Shaw & Mattern, 2009; Sparfeldt, Buch, Rost, & Lehmann, 2004; Talento-Miller & Peyton, 2006). In particular, all studies but one (Shaw & Mattern, 2009) replicated the significant tendency to over-report grades.

One central particularity about the tendency to over-report grades is that it refers to *past* achievement rather than *future* achievement. Past achievement is usually known and can therefore be over-*reported*, while future achievement is unknown and can therefore only be over-*estimated*. Thus, when it come to evaluating one's performance, the temporal perspective is central. Willard and Gramzow (2008) found that the tendency for students to retrospectively report test scores that were higher than what they actually achieved becomes more marked with increasing temporal distance. On the other hand, over-estimating *future* grades has also been conceptualized as a form of self-enhancement and was found to be negatively associated with academic achievement (Buckelew, Byrd, Key, Thornton, & Merwin, 2013). Self-enhancement that refers to future events has also been studied in research on *calibration of self-concept* (Alexander, 2013). Calibration of self-concept is therefore a specific form of self-enhancement that describes the match between one's perception of ability (i.e., self-concept) and one's actual ability (e.g., task performance; Bol, Hacker, O'Shea, & Allen, 2005): Students can either accurately (i.e., high calibration) or inaccurately (i.e., low calibration) judge their ability. Those students who inaccurately judge their ability can be further divided into under- and overconfident students (as opposed to under- and over-reporting of past grades). In sum, over-reporting past grades and over-estimating future grades (i.e., over-confident calibration) differ in that past grades simply need to be remembered and

reported, while a precise calibration of one's self concept is needed to be able to adequately predict one's future performance (Chiu & Klassen, 2010). In the present study, we focused on over-reporting of past grades.

Although there is a paucity of research that has examined the psychological mechanisms that underlie the tendency to over-report academic grades, there is evidence suggesting that it represents a self-enhancement mechanism. Dickhäuser and Plenter (2005) found that over-reporting of grades was positively correlated with academic self-concept in the domain of mathematics. The authors suggested that this might be indicative of a self-enhancement mechanism but did not expand on this suggestion. Similarly, Gramzow and Willard (2006) showed that GPA exaggeration is associated with self-enhancement and Willard and Gramzow (2008) considered the tendency to report test scores as higher than they were to be a form of self-enhancement. Further, it was proposed that such enhanced self-reports might be explained by the need to perceive the self as constantly improving (Ross & Wilson, 2003). Schwartz and Beaver (2014) argued that this need might be motivated by the pressure to obtain good grades that is experienced in school, family, and peer contexts. Considering that the tendency to over-report grades has been observed in many studies where participants knew that no link between their responses and their identity was possible (i.e., when completing an anonymous self-report questionnaire), it can be assumed that this specific form of self-enhancement might be private rather than public. Further, Sedikides and Gregg (2008) discussed that self-enhancement can also manifest itself in less obvious ways than individuals explicitly stating that they believe to be above average with respect to some task. Reporting about *past* grades might be one of these less obvious manifestations of self-enhancement, as students may not be explicitly aware that their report will be used to determine if they self-enhanced (i.e., implicit assessment). Thus, it might be assumed that over-reporting past grade might be candid rather than tactical. While over-reporting grades

has been interpreted as an indicator of self-enhancement, it is unclear if under-reporting grades might be interpreted as an indicator of self-handicapping. Thus, we can not safely assume that over-reporting and under-reporting are two ends of a continuum in terms of effects on self-concept and achievement. Accordingly, we will focus solely on over-reporting as an indicator of self-enhancement. In light of these studies showing that reporting past grades and estimating future grades involves self-enhancement mechanisms, questions arise concerning whether this specific form of self-enhancement is adaptive or maladaptive in terms of both self-concept and achievement and whether its effects differ in the short and long term. The present study addresses these questions with a focus on the short- and long-term effects of over-reporting *past* grades (i.e., self-enhancement) on self-concept and achievement.

Self-enhancement has been shown to be adaptive in the short term because it is positively associated with self-concept and achievement (Dickhäuser & Plenter, 2005; Kuncel et al., 2005), positively associated with self-esteem (i.e., the global component of self-concept) and well-being (Robins & Beer, 2001), and negatively associated with depressive symptoms (Noble, Heath, & Toste, 2011). Regarding calibration, Chiu and Klassen (2010) found that better calibration of mathematics self-concept was associated with higher mathematics self-concept and achievement. Moreover, the authors found that students who overestimated their mathematics self-concept had lower mathematics achievement. In sum, the short-term effects of self-enhancement seem to be adaptive in terms of academic self-concept and achievement, while those of over-confident calibration seem to be maladaptive.

Results on the long-term effects of self-enhancement obtained thus far are controversial. From a theoretical point of view, self-enhancing perceptions are assumed to increase motivation, persistence, and performance (Taylor & Brown, 1988, 1994). However, in a longitudinal study on the short- and long-term effects of positive illusions (i.e., a form of

self-enhancement), Robins and Beer (2001) found that self-enhancement led to a number of maladaptive developments in the long term such as decreases in self-esteem and well-being, as well as increased disengagement from the school context across several years. However, Robins and Beer found no direct cross-sectional or longitudinal associations between self-enhancement and academic performance or graduation rates. Vancouver and Kendall (2006) found that overestimation of one's ability might negatively affect preparation and lead to lower performance. Further, Ackermann and Wolman (2007) discussed that people who believe they can outperform their peers might exhibit inflated self-concepts, which might in turn lead to less preparation and help-seeking, and poor performance (Stone & May, 2002).

Taken together, these findings suggest that the short-term effects of self-enhancement on self-concept and achievement are predominantly positive, which conforms to the definition of self-enhancement and its psychological mechanisms. As an example, students that self-enhance, be it consciously or unconsciously, publicly or privately, might feel better in that very moment (i.e., better self-concept). However, the long-term effects of self-enhancement were found to be predominantly negative, which might be due to inflated self-concepts (i.e., the short-term benefit of self-enhancement) that might put students at risk of less learning effort and, consequently, lower achievement. For instance, students that tend to self-enhance might feel more competent than they actually are (i.e., overestimated self-concept) with respect to a given task (e.g., an exam) and might therefore be less prone to show behaviors that are necessary to be able to perform well. Thus, what appears to be adaptive in the short term (i.e., better self-concept) might turn out to be maladaptive in the long term (i.e., lower achievement).

To date, research on the longitudinal interplay between self-enhancement, self-concept, and achievement is scarce. Previous research suggests that self-enhancement increases one's self-concept in the short-term (Dickhäuser & Plenter, 2005; Sedikides &

Strube, 1997). Further, existing evidence indicates that there is a positive and reciprocal longitudinal relation between self-concept and achievement within the same academic subject (Marsh, 1986; Marsh & Craven, 2006; Möller, Retelsdorf, Köller, & Marsh, 2011; Niepel et al., 2014). While the *bivariate* associations between self-enhancement and self-concept, and self-enhancement and achievement, were examined in a number of studies, there has yet to be a study that simultaneously examines the effects of self-enhancement on self-concept and achievement across high school using a longitudinal and *trivariate* approach. Since self-enhancement was found to be associated with self-concept, and self-concept was found to be associated with achievement, a trivariate approach is needed to explore how these three constructs work in concert. In this regard, it might be assumed that self-enhancement leads to a higher self-concept (Dickhäuser & Plenter, 2005) or self-esteem (Robins & Beer, 2001) in the short term. In turn, self-concept or self-esteem may lead to higher achievement as these constructs are positively and reciprocally associated with each other both cross-sectionally and longitudinally within the same academic subject (Marsh, 1986; Marsh & Craven, 2006; Möller et al., 2011; Niepel et al., 2014). Alternatively, an inflated self-concept or self-esteem may lead to a decrease in achievement, possibly resulting from less effort invested in learning and achievement-striving (Robins & Beer, 2001; Stone & May, 2002; Svanum & Bigatti, 2006).

Thus far, only Robins and Beer (2001) have examined all of these constructs simultaneously within a longitudinal framework (i.e., self-enhancement, self-concept, and achievement), although they focused on self-esteem instead of self-concept. In addition to utilizing more sophisticated statistical methods, namely latent growth modeling (LGM), their study was the first to adopt a longitudinal approach to examine long-term effects of self-enhancement while at the same time using an external criterion (i.e., ability measured by SAT scores) to operationalize self-enhancement (i.e., difference between self-evaluated and actual

ability). However, Robins and Beer examined *bivariate* longitudinal associations only. Therefore, the role of self-concept in the longitudinal association between self-enhancement and achievement has yet to be explored. As outlined above, self-enhancement, self-concept, and achievement are associated with each other. Thus, it is important to examine the longitudinal development of these three constructs in concert. If the associations between constructs are only studied in a bivariate framework, more complex trivariate associations (e.g., indirect effects) might remain undetected thereby leading to incomplete conclusions. By taking a trivariate approach, we aim at overcoming this methodological limitation and expanding our knowledge on the longitudinal interplay between self-enhancement, self-concept, and achievement.

Aims and Hypotheses

The purpose of the present study was to examine the longitudinal interplay between self-enhancement, self-concept, and achievement using a trivariate approach. Our first aim was to replicate cross-sectional results pertaining to the association between self-enhancement, self-concept, and achievement. In this regard, we hypothesized (1) that higher levels of self-enhancement would be cross-sectionally associated with higher scores of self-concept (Dickhäuser & Plenter, 2005; Robins & Beer, 2001), (2) that higher levels of self-enhancement would be associated with higher achievement (Kuncel et al., 2005), and (3) that higher levels of self-concept would be associated with higher levels of achievement within the same academic subject (Marsh, 1986; Marsh & Craven, 2006; Niepel et al., 2014).

Our second aim was to explore the long-term effects of self-enhancement on self-concept and achievement. In line with results obtained by Robins and Beer (2001), we hypothesized that self-enhancement would be negatively associated with the development of self-concept. Based on previous finding also from Robins and Beer (2001), we did not expected to find a significant direct association between the initial level of self-enhancement

and the development of achievement; thus, no specific hypothesis was constructed in this regard. Additionally, we hypothesized that there would be a reciprocal and positive longitudinal association between self-concept and achievement (Marsh, 1986; Marsh & Craven, 2006; Möller et al., 2011; Niepel et al., 2014). Finally, we explored potential indirect long-term effects of self-enhancement on achievement that were mediated by self-concept.

Method

Sample and Procedure

The present study was conducted in the German-speaking part of Switzerland. A total of three assessments were carried out in the spring of 2012 (T1), 2013 (T2), and 2014 (T3). The timing of the assessments was designed so that the entire period of upper-track school in Switzerland was covered (known as Gymnasium schools in the Swiss-based state school system). Since most students attend the same school for these three years, this design element also ensured that the academic context was stable over time. As most students move to vocational or tertiary education after Gymnasium, the Gymnasium years are a crucial period in the development of motivational constructs such as self-concept, which is highly relevant for the transition to higher education. Finally, one-year intervals are typically chosen for the study of long-term developments (e.g., Robins and Beer, 2001).

From all German-speaking upper-track schools in Switzerland where the four academic subjects of mathematics, German, English, and French were taught in Grades 9 to 11, eight Gymnasium were randomly selected for participation in the present study. All students in the 45 Grade 9 classrooms from these eight schools were eligible to participate. A total of 916 students participated in the first assessment (56.1% female; mean age 15.6 years, *SD* = .63), 719 participated in the second assessment (55.5% female; mean age 16.6 years, *SD* = .63), and 647 participated in the third assessment (55.3% female; mean age 17.7 years, *SD* = .75). Attrition was mainly due to one school dropping out of the study after the first

assessment (n = 146), to students leaving the school they were initially assessed at, or to students being absent during data collection. To avoid a substantial drop in statistical power due to the reduction in sample size, 42 students were additionally recruited at T2 and 38 students were additionally recruited at T3. A subsample of 571 (57.4%) students participated in all three assessments, while 145 (14.6%) participated in two assessments, and 280 (28%) participated in only one assessment. In sum, a total of 996 students participated in at least one measurement occasion of the present study.

A total of 90.7% of the participants were born in Switzerland, while 6.2% were born in other European countries. Regarding the participants' parents' nationality, the respective percentages were 68.8% and 19.6% for participants' mothers and 71.0% and 19.5% for their fathers. A total of 87.1% of the students spoke German at home, while 1.0% spoke French and 0.8% spoke Italian. Among those participants not speaking a national language at home, the three most common languages were Albanian (1.4%), Tamil (1.1%), and Turkish (1.0%). Regarding parents' education, 31.6% of the participants' mothers and 46.2% of their fathers held a university or college degree. Of those parents without a university degree, 47.6% of mothers and 40.8% of fathers held a vocational college degree, and 12.6% of mothers and 11.6% of fathers had a high-school diploma. 0.5% of the participants' parents had not completed high school.

Assessments were carried out in the classrooms during a single, 45-minute lesson using a paper and pencil questionnaire. Before the first assessment, participants were informed that participation in the study was voluntary and that they could discontinue their involvement at any time without any negative consequences. Furthermore, all parents or guardians were informed about the study, its aims, and its procedures. The heads of schools and the teachers who taught in the classes from which the participants were drawn approved the study protocol. Every participant was given a personal identification number and was

asked to write it on their questionnaire before beginning. After the data were collected and entered, all identifiers linking participants to their data were deleted. Thus, analyses were conducted on depersonalized data. After each assessment, participants were compensated with a small gift, such as chocolate, and entry into a prize draw to win an Apple iPod.

Regarding the sequence of assessment for the three constructs of interest, it must be noted that while actual grades were given to the students in December, students' self-reported grades, self-enhancement, and academic self-concept, which corresponded with their December grades, were assessed in the spring of the subsequent year.

Study Measures

Demographic variables. Participants' gender and age were obtained via self-report at each assessment.

Actual academic achievement. Each student's midyear grades (i.e., grades obtained in December of the previous year, roughly four months before the assessments at T1, T2, and T3) in mathematics, German, English, and French were provided by the respective school administrations at each assessment and were linked to the individual data using anonymous identification codes. In Switzerland, grades range from 1 (*insufficient*) to 6 (*excellent*) with 4 being the threshold for a sufficient grade. Half grades (e.g., 4.5) are also common in Switzerland. Grades are generally determined by the results that students obtain in their exams across a term. The exam formats vary as a function of the academic subject. For instance, mathematics exams usually consist of solving mathematical problems, while compositions, presentations, and vocabulary tests are common in linguistics courses. In the foreign languages (i.e., English and French in the present study), translations are also used as a form of exam. Table 1 shows the mean scores and standard deviations of actual grades at each assessment and for each academic subject.

Self-reported academic achievement. At each assessment, participants were asked to report their last midyear grades (i.e., grades obtained in December of the previous year, roughly four months before the assessments at T1, T2, and T3) in mathematics, German, English, and French classes.

Self-enhancement. In line with recommendations by Robins and Beer (2001), we adopted an external criterion to operationalize self-enhancement, which was defined as the amount which students over-reported their academic grades. This operationalization comes with the advantage that the resulting measure is less biased than other measures for self-enhancement (e.g., estimating one's performance relative to the perceived performance of others). Further, the resulting measure is continuous instead of categorical (i.e., better, equal, or worse than others' performance).

Initially, actual academic grades were subtracted from the self-reported academic grades. This operation resulted in students with negative scores (i.e., the self-reported grade was lower than the actual grade, which will be labeled *under-reporting*), null scores (i.e., accurate reporting), and positive scores (i.e., the self-reported grade was higher than the actual grade, which will be labeled *over-reporting*). The difference between the actual grade and the self-reported grade does *not* represent a clear operationalization of over-reporting, as it also encompasses under-reporting. As outlined above, we cannot safely assume that under-reporting and over-reporting are two ends of a continuum that can be labelled self-enhancement. If we did, then under-reporting would represent self-handicapping, which is not the opposite of self-enhancement in terms of its effects on self-concept and achievement (Sedikides & Gregg, 2008). In order to actually operationalize self-enhancement in the context of this study, participants that under-reported their grade were given a score of 0 on self-enhancement. This was done for each academic subject. Notably, this transformation led to a decrease in the variance of self-enhancement, which resulted in decreased correlations of

self-enhancement with achievement and self-concept, and, therefore, to a more conservative analysis strategy. Table 1 displays the mean scores and standard deviations of self-enhancement at each assessment and for each academic subject.

Academic self-concept. The Self-Description Questionnaire (Marsh & O'Neill, 1984) was used to assess self-concept in mathematics, German, English, and French. The scale encompassed a total of three items: (1) I get good marks in [ACADEMIC SUBJECT]; (2) [ACADEMIC SUBJECT] is one of my best subjects; and (3) I have always done well in [ACADEMIC SUBJECT]. Response options consisted of a 5-point Likert scale (from 1 = *strongly disagree* to 5 = *strongly agree*). A mean score of the three items was computed for each academic subject separately and was used in the following analyses. The internal consistencies (Cronbach's alpha) of the mean scores across all subjects and within assessments were found to be between .84 and .91. Table 1 shows the mean scores and standard deviations referring to the summative scales divided by the number of scale items.

Data Analysis

The main aim of the present paper was to examine the longitudinal association between self-enhancement, self-concept, and achievement. Before addressing the main research question, unconditional multilevel models were used to assess the intra-class correlation (ICC) of self-enhancement across the four academic subjects. Individuals were modeled as level 1 units and classrooms were modeled as level 2 units. These analyses showed that the ICC of self-enhancement was .040, .024, and .039 at T1, T2, and T3, respectively. The respective ICCs for self-concept where .014, .013, and .037, while those for achievement were .042, .035, and .038. These results revealed that almost all of the variance in the three variables lay at the individual level, while hardly any variance lay at the class level (Heinrich & Lynn, 2001; Lee, 2000). Nevertheless, we did take the classroom level into

account in order to address the dependence of observation within classrooms. This was achieved using the sandwich estimator.

The longitudinal interplay between self-enhancement, self-concept, and achievement was examined using a trivariate parallel process latent growth model (TPPLGM; King, Nguyen, Kosterman, Bailey, & Hawkins, 2012), which is an extension of the parallel process latent growth model (PPLGM; Chung, White, Hipwell, Stepp, & Loeber, 2010). This model allowed us to test whether latent growth parameters of one latent growth model (LGM) predicted those of another LGM.[3]

Our aim was to model a single TPPLGM in which it would be possible to examine the hypotheses while taking the four academic subjects into account as covariates. All variables were collected with respect to the four academic subjects. Therefore, the structure of the data was crossed, with student being nested in classes and academic subjects. Thus, it was necessary to restructure the dataset. More precisely, it was necessary to obtain only one variable for each one of the constructs of interest (e.g., self-concept) instead of four (e.g., mathematics self-concept, German self-concept, English self-concept, French self-concept). Accordingly, we decided to restructure the data so that every student would have four data rows, where the first row would contain the scores relative to mathematics, followed by a second, third, and fourth row containing the information relative to German, English, and

[3] If a linear development is assumed, each LGM will encompass an intercept and a slope, which describe the *intra*individual development across time. The intercept represents the initial score, while the slope describes how scores develop over time (i.e., increase vs. decrease). The intercept and the slope variances capture interindividual differences in intraindividual development and, therefore, their correlation is highly informative. For instance, a positive correlation indicates that higher initial scores are associated with more positive slopes over time. It is important to note that the meaning of *more positive* depends on the mean slope. If the mean slope across all students is negative, a more *positive* slope indicates that the decrease is less pronounced and might even turn into an increase. If the mean slope is negative, a more *negative* slope indicates that the decrease becomes even more pronounced. The reverse rationale applies to positive mean slopes. Associations between intercepts and slopes can be examined within a construct as well as across multiple constructs. Moreover, one can also examine the correlations among multiple intercepts and among multiple slopes of different constructs. However, no causal interpretations are possible, as the intercept might be causally influenced by earlier events that were not included in the model. Accordingly, associations between latent growth parameters are usually modeled as correlations. For more information on LGMs, see Bollen and Curran (2005).

French, respectively. This operation multiplied the length of the dataset by four and reduced the number of variables to one for each construct (i.e., self-concept, actual grade, and self-enhancement). The effect of the academic subjects on the growth parameters was controlled for in the analyses. This strategy has been discussed and applied as a way to deal with crossed data structures (Goetz, Sticca, Pekrun, Murayama, & Elliot, 2016; Huang, 2016). With this data structure it was possible to model a single TPPLGM instead of four different TPPLGMs for the four academic subjects. Table 2 shows the zero-order correlations between all study variables. Correlations are reported separately for each academic subject.

Separate univariate LGMs were modeled for self-enhancement, self-concept, and achievement in order to assess their model fit. All LGMs were modeled as first-order LGMs using the three observed scores of the respective constructs to estimate a latent intercept and a latent slope (i.e., a linear development was assumed). Accordingly, the factor loadings from the latent intercept to the observed scores of absolute inaccuracy were all set to 1, while those of the latent slope were set to 0, 1, and 2 (Bollen & Curran, 2005). The three LGMs were then combined into a TPPLGM, and covariances between the latent growth parameters (i.e., intercepts and slopes) were modeled. The residual variances of the observed variables that were assessed at the same time point were also allowed to covary (e.g., self-enhancement at T1 and self-concept at T1). No further modifications were made to the TPPLGM. In the final step, we proceeded to extend the TPPLGM by including gender, age, and academic subject as time-invariant covariates. Analyses were performed using Mplus 7.11 (Muthén & Muthén, 2012). As the self-enhancement variables were non-normally distributed, robust maximum likelihood was used as an estimation algorithm.[4]

[4] The distribution of self-enhancement was skewed. A potential modeling strategy that would address this complication is the two-part latent growth model (TP-LGM). Herein, data is split into a dichotomous part and a linear part. In the dichotomous part, scores are recoded into 0 and 1, where a score of 1 is given to those who self-enhanced, independently of the amount of self-enhancement, and a score of 0 is given to all others. In the continuous part, those who did not self-enhance are given a missing value, while all others retain their score.

Participant attrition across the study was largely due to one school dropping out after the first assessment because of organizational issues that were unrelated to any of the variables under examination in the present study. Other less prominent causes of attrition were students leaving a school or being absent during data collection, which could be assumed to be unrelated to any of the variables under examination in the present study. Accordingly, it was assumed that data were missing at random, and the full information maximum likelihood (FIML) method was used to address missing data. To evaluate the extent to which the FIML procedure was appropriate for the longitudinal analyses at hand, we compared (a) the mean scores of self-concept, actual achievement, and self-reported achievement of students with compete data to (b) the same means scores that were obtained from the entire sample using the FIML method for the imputation of missing values. Results showed that means scores were almost identical for all pairs of means scores, suggesting that the FIML procedure was indeed well suited.

Results

Univariate Longitudinal Development of Self-Enhancement, Academic Self-Concept, and Academic Achievement

The univariate LGMs for self-enhancement, self-concept, and achievement were found to match the data well (see Table 3). Table 4 shows the mean scores and the standard

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Thus, the dichotomous part describes the initial percentage of self-enhancers (i.e., intercept) and its change (i.e., slope). The continuous part describes the initial level of self-enhancement and its change. These two parts can then be joined into a parallel process model. The modeling of the dichotomous part requires one dimension of integration for each latent variable, resulting in two dimensions of integration in this specific case (i.e., intercept and slope). The model becomes computationally demanding when adding further processes to the model such as self-concept and achievement. In particular, the correlations of residuals from the same time point need to be modeled in order to not distort the correlations among the latent growth parameters. As correlations between linear and dichotomous indicators cannot be modeled, a latent variable has to be modeled. In the present analysis, this resulted in a total of five dimensions of integration. Even more computational demands arise when adding covariates to the model. Finally, indirect effects can not be examined within this framework. In sum, the option to run a TP-LGM for self-enhancement and to integrate it into a TP-TPPLGM seemed to be impracticable in the present study. Therefore, a traditional approach with underlying assumptions of normality was taken.

deviations of the three LGMs. Note that these are not estimates gained from the univariate LGMs but from the TPPLGM without covariates, which were virtually equal to those obtained from the univariate LGMs. Regarding self-enhancement, we found that the initial level (i.e., intercept) was almost one tenth of a grade. This initial score was found to have significant variance. The change over time (i.e., the slope) of self-enhancement was found to be positive, but its variance was not significant. In other words, on average, students were found to self-enhance at the first assessment and this tendency was found to increase over time. Students were found to differ in their initial level of self-enhancement, but the increase in self-enhancement from Grade 9 to Grade 11 was found to be the same for all students. As for self-concept, we found that the initial score was close to the middle of the scale and had a significant variance. Over time, self-concept was found to significantly decrease and this decrease had a significant variance. Thus, students were found to differ regarding their initial level of self-concept and its development over time, with most students experiencing a decrease. Finally, the results for achievement showed that the initial score was found to be half a point above the threshold for a sufficient grade and to have a significant variance. The longitudinal trend in achievement was also found to be significantly negative and to have a significant variance. Accordingly, students were found to differ regarding their initial level of achievement and its development over time, with most students experiencing a decrease. In summary, from Grade 9 to Grade 11, self-enhancement was found to increase while self-concept and achievement were found to decrease (see Figure 1).

Cross-Sectional Relations Between Self-Enhancement, Academic Self-Concept, and Academic Achievement

The correlations between all latent growth parameters are reported in Table 4. Additionally, *Figure 1* shows the standardized solution of the TPPLGM. Note that error covariances are not displayed in *Figure 1*, and the correlations among the latent growth

parameters represent residual correlations (i.e., controlled for the gender, age, and academic subject covariates). Regarding the associations among intercepts (i.e., initial scores), the intercept of self-enhancement was found to be positively associated with the intercept of self-concept, but not with the intercept of achievement. Moreover, the intercept of self-concept was associated with the intercept of achievement. Thus, higher initial scores of self-enhancement were associated with higher initial scores of self-concept, which were in turn associated with higher initial scores of achievement.

Longitudinal Interplay Between Self-Enhancement, Academic Self-Concept, and Academic Achievement

Associations among slopes (i.e., linear change over time). The slope of self-enhancement was neither found to be significantly associated with the slope of self-concept, nor with the slope of achievement. However, the slope of self-concept was positively associated with the slope of achievement. Therefore, more positive slopes of self-concept were associated with more positive slopes of achievement.

Associations between intercepts and slopes. The intercept of self-enhancement was negatively associated with the slope of self-concept. Further, the intercept of self-concept was found to be negatively associated with the slopes of both self-concept and achievement. Finally, the intercept of achievement was negatively associated with the slope of self-concept. In other words, students with higher initial scores of self-enhancement were found to have more negative slopes of self-concept. Students with higher initial scores of self-concept were found to have more negative slopes of both self-concept and achievement. Students with higher initial scores of achievement were found to have more negative slopes of self-concept. All other associations between intercepts and slopes were non-significant.

Regarding the effects of the covariates on the latent growth parameters of self-enhancement, self-concept, and achievement (see Table 5), we found that males had a slightly

higher intercept of self-enhancement, as well as a lower intercept and more negative slope of both self-concept and achievement. Age was found to be positively associated with the intercept of self-enhancement. As for the effect of the academic subject where mathematics was the reference category, German was found to have a higher intercept of self-concept, as well as a higher intercept and a more positive slope of achievement. English was found to have a higher intercept and a more negative slope of self-concept, as well as a higher intercept of achievement. Finally, French did not differ from mathematics on any of the latent growth parameters. It must be noted that these results were controlled for the effect of the respective other covariates and that effect sizes were found to be quite low.

Indirect effect of self-enhancement on academic achievement. Although there was no statistically significant association between the intercept of self-enhancement and the slope of achievement, the possibility of an exclusively indirect association between these two growth parameters could still be examined. To this end, an indirect effect was modeled within the TPPLGM to test whether the association between the initial score of self-enhancement and the slope of achievement could be explained by the initial score of self-concept. The rationale for the selection of direct paths to be modeled was based on two considerations. First, self-enhancement was discussed as a strategy to enhance one's self-concept in the short term. This was modeled as a direct path (as opposed to the correlation reported above) from the intercept of self-enhancement to the intercept of self-concept. Second, self-concept has been found to be associated with increases in achievement within the same academic subject (Marsh, 1986; Marsh & Craven, 2006; Möller et al., 2011; Niepel et al., 2014). This was modeled as a direct path from the intercept of self-concept to the slope of achievement. In addition, we tested if the indirect effect from the intercept of self-enhancement to the intercept of self-concept and on to the slope of achievement was significant. The resulting model was found to fit the data well, as it was equivalent to the TPPLGM with covariates. Results of the TPPLGM with the

indirect effect suggested that the effect of the intercept of self-enhancement on the slope of achievement could be explained by the intercept of self-concept (β = -.06; p < .001). Students that displayed self-enhancement in Grade 9 showed a higher self-concept in Grade 9 (β = .28; p < .001), which in turn led to a more negative slope in their achievement from Grade 9 to Grade 11 (β = -.28; p < .01).

Discussion

The purpose of the present study was to examine the longitudinal interplay between self-enhancement, self-concept, and achievement among students progressing from Grades 9 to 11. First, cross-sectional results on the association between self-enhancement, self-concept, and achievement were replicated. Second, long-term effects of self-enhancement on self-concept and achievement were explored. Finally, indirect long-term effects of self-enhancement on achievement that could be partially explained by an inflated self-concept were examined. To fulfill these objectives, a trivariate parallel process latent growth model (TPPLGM) was employed.

Cross-Sectional Relations Between Self-Enhancement, Academic Self-Concept, and Academic Achievement

The cross-sectional portion of the analyses (i.e., from the TPPLGM) indicated that, in the short term (i.e., during the same school year), students with high scores of self-enhancement showed higher scores of self-concept (controlling for gender, age, and academic subject). This result confirms our hypothesis and is in line with previous research on the effect of self-enhancement on self-esteem (Robins & Beer, 2001) and self-concept (Dickhäuser & Plenter, 2005). Furthermore, no direct association was found between self-enhancement and achievement in the short term. This result also confirms our expectation and is consistent with

previous research (Robins & Beer, 2001). As for the cross-sectional association between self-concept and achievement, the TPPLGM yielded a very high and positive correlation between these constructs, which is in line with our hypothesis and past findings (Marsh, 1986; Marsh & Craven, 2006; Niepel et al., 2014). In sum, self-enhancement appears to be an adaptive strategy in the short term—it was associated with a better self-concept, which was in turn positively associated with achievement. However, there was no direct association between self-enhancement and achievement in the short term.

Longitudinal Interplay Between Self-Enhancement, Academic Self-Concept, and Academic Achievement

Self-enhancement and academic self-concept. The longitudinal portion of the TPPLGM indicated that, in the long term (i.e., over multiple school years), self-enhancement was associated with a stronger decrease in self-concept. Thus, students with higher initial scores of self-enhancement tended to have more pronounced decreases in self-concept, which is in line with our hypothesis and with results obtained by Robins and Beer (2001) on the long-term effect of self-enhancement on self-esteem. Notably, the reverse association was not found to be significant—that is, the initial score of self-concept was not associated with the slope of self-enhancement. Although causality cannot be proven with these models, this pattern of associations supports the notion that self-enhancement drives changes in self-concept, not vice-versa.

Academic self-concept and academic achievement. As for the relation between self-concept and achievement, our results suggest that their longitudinal association is reciprocal and negative. On the one hand, higher initial self-concept was associated with a stronger decrease in achievement. On the other hand, higher initial achievement was associated with a stronger decrease in self-concept. These results are in contrast to the hypotheses of the current study and initially appear to be inconsistent with the findings from previous research (Marsh,

1986; Marsh & Craven, 2006; Niepel et al., 2014). However, these results must be interpreted with caution and in the context of the existing associations among intercepts and slopes rather than in isolation. To this end, estimated growth trajectories of achievement for students with low (i.e., one SD below the mean), mean, and high (i.e., one SD above the mean) initial scores of self-concept were computed (see *Figure 2*). These additional results revealed that students who scored higher on self-concept at the first time point showed a more marked decrease in achievement over time. Importantly, these were also students with higher achievement scores at the first time point. Thus, although their decrease in achievement over time was more pronounced, these students tended to score highest on achievement relative to their peers, which is consistent with previous studies (e.g., Möller et al., 2011; Niepel et al., 2014). The same rationale applies to the association between the intercept of achievement and the growth of academic self-concept (see *Figure 3*).

Self-enhancement and academic achievement. Consistent with our expectation based on the results obtained by Robins and Beer (2001), we did not find any direct association between the initial level of self-enhancement and the development of achievement. However, our results suggest that the effect of self-enhancement on academic grades might be indirect rather than direct. High initial levels of self-enhancement were associated with higher levels of self-concept in the short term, and this inflated self-concept heightened the risk of a decrease in achievement over multiple years. In other words, our results suggest that the long-term decrease in achievement could be partly explained by the short-term increase in self-concept that is partly due to self-enhancement. In summary, self-enhancement was directly linked to a stronger decrease in self-concept and indirectly to a long-term decrease in achievement. These results extend the findings reported by Robins and Beer and, in so doing, do not support the notion that self-enhancement acts as a motivator in

the face of adversity, thereby leading to better performance in the long term (Taylor & Brown, 1988, 1994).

Self-Enhancement as a Risk Factor for Declines in Academic Self-Concept and Achievement

On average, self-enhancement was found to slightly increase from Grades 9 to 11. Considering that self-enhancement seems to have long-term disadvantages, one might ask why some students keep self-enhancing. The answer may be that they do it because of the short-term advantages. Indeed, Robins and Beer (2001) acknowledged that self-enhancement can be a strategy by which students regulate their affect and self-esteem in situations that pose a threat to the self, which is particularly pronounced in individuals scoring high on narcissism. This strategy might work well in the short term but, as it is based on unrealistic self-evaluation, it represents a risk for a decrease in self-concept and achievement in the long term (Robins & Beer, 2001). Our results support this notion, as self-enhancement artificially increased self-concept in the short term. This unrealistic increase makes the attainment of one's expectations equally unrealistic, which might result in lower achievement than expected. If expectations are not met, the self-concept is threatened, and self-enhancement might be triggered again to maintain a stable self-view. Thus, a vicious cycle could arise from these dynamics.

The role of learning effort. Learning effort is a variable that could explain why an inflated self-concept (as a result of self-enhancement) might lead to a stronger decrease in achievement in different academic subjects. Svanum and Bigatti (2006) found that uninformed and wishful optimism, which might also be interpreted as an indicator of self-enhancement, was associated with a lack of learning effort and learning skills (e.g., problem solving, critical thinking, meta-cognition), especially for students with low ability. Robins and Beer (2001) also discussed that learning effort might play a moderating role in this regard: If

self-enhancement leads to an increase in one's self concept *and* is accompanied by greater learning efforts, achievement is likely to remain stable or to increase. If, however, self-enhancement leads to an increase in one's self-concept *and* is accompanied by lower effort or excessive procrastination, achievement may be negatively affected in the long term. Thus, it is possible that students that self-enhance tend to underestimate the effort that is needed to attain a certain level of achievement, which increases the likelihood that they invest an insufficient amount of effort. In contrast, Svanum and Bigatti found that students that displayed informed and aspirational optimism were more likely to invest appropriate effort and attain better grades. Accordingly, learning effort might moderate the indirect effect of self-enhancement on achievement. However, the potential moderating role of learning effort remains hypothetical and would need to be examined in future studies.

The role of causal attributions. Causal attributions (Weiner, Heckhausen, & Meyer, 1972) might play an important reinforcing role in the processes described above. There is some evidence indicating that high self-enhancement is accompanied by protective attributions in case of failure to meet one's expectations (Buckelew et al., 2013; Robins & Beer, 2001). In particular, it has been shown that self-enhancers tend to attribute success to internal and stable causes (e.g., ability) while at the same time attributing failure to external and unstable causes (e.g., luck). This self-protective strategy might prevent the student from realizing the reason(s) for his or her suboptimal grades, which in turn might put the student at risk for continued self-enhancement, an unrealistic self-concept, and the resulting decreases in achievement. Thus, the aforementioned vicious cycle may be reinforced by these attributions so that the likelihood of change in learning behavior is reduced (Buckelew et al., 2013). Over time, the strategy of self-enhancement will likely become less effective as the decrease in achievement will inevitably affect the self-concept causing it to decline. In the worst case, self-enhancers might choose to disengage from the academic context (Robins & Beer, 2001)

and disregard its importance for the self, which could lead to a stronger decrease in achievement.

In sum, the effect of self-enhancement on achievement seems to be quite complex and involves a number of moderating (e.g., effort) and mediating (e.g., attributions) factors. Accordingly, future research might explore the longitudinal mediating and moderating roles of these variables. Such knowledge would enhance our understanding of the conditions under which different forms of self-enhancement influence self-concept and achievement in the long term. Subsequent efforts could be taken to design interventions aimed at optimizing learning strategies, effort, and achievement.

Over-Reporting and Over-Confident Calibration: Two Sides of the Same Coin?

Exaggerated self-evaluations have been found with respect to many personal characteristics and have been examined from different points of view and under different labels such as self-observer rating discrepancies (e.g., Nilsen & Campbell, 1993), optimisms (Weinstein, 1980), positive illusions and creative self-deception (Taylor & Brown, 1994), calibration (Alexander, 2013), and self-enhancement (Sedikides & Gregg, 2008). In the present study, we focused on over-reporting of past grades as a form of self-enhancement that needs to be distinguished from other forms of self-enhancement that refer to future events. As outlined in the introduction, there is a seemingly small but quite important difference between over-reporting past achievement and being over-confident (i.e., low calibration) about future achievement: certainty versus uncertainty. To date, no study has examined whether these two forms of self-enhancement are differentially linked to self-concept and achievement (or other constructs) in the long term. Results from the present study and from research on over-estimating grades (Buckelew et al., 2013) and on calibration (Chiu & Klassen, 2010) suggest that all forms of self-enhancement might have undesirable long-term effects, including less learning effort and external attributions (see above). Future studies might therefore want to

explore these differential long-term effects and/or shed light on the associations between forms of self-enhancement that refer to past and to future events. It might be that students that over-report past grades also tend to over-estimate future grades because the underlying mechanism can be assumed to be the same, namely self-enhancement.

Implications for Practice

The results of the present study suggest that greater self-enhancement can result in a stronger decrease in self-concept and achievement in the long term. It is important to note that there is not a threshold above which self-enhancement turns from a *positive* effect to a *negative* long-term effect on self-concept and achievement. Yet self-enhancement is linearly and negatively associated with self-concept and achievement such that greater initial self-enhancement equals greater decline in self-concept and achievement over time. In light of these results, one implication for practice is that it might be crucial to educate students on the importance of accurate self-evaluations and realistic self-expectations regarding both past and future achievements (i.e., accurate calibration of self-concept). Further, as Buckelew et al. (2013) discussed, it is important to increase students' awareness of the potentially negative effects of external attributions following failure and to train them to develop an attributional style that leads to higher school-engagement and adaptive coping strategies. As Svanum and Bigatti (2006) acknowledged, this does not mean that optimism needs to be curbed or discouraged. Rather, students need clarification and instruction regarding the skills and commitment needed to attain their expected level of achievement. This might be particularly important for students with comparably low ability, as previous research has shown that the tendency to self-enhance is notably pronounced among this group, possibly resulting from perceived added pressure to obtain better grades (Minkov, 2008; Schwartz & Beaver, 2014). Unfortunately, they may tend to use self-enhancement to regulate their self-concept in the

short term but are unable to follow up with appropriate learning efforts, which might negatively affect their achievement.

Strengths and Limitations

To the best of our knowledge, this is the first study to adopt a *trivariate* longitudinal approach to examine the interplay between the latent developments of self-enhancement, self-concept, and achievement. This approach yielded the first empirical findings on the reciprocal longitudinal relations between these three constructs and provided initial insight into the complexity of their relations. The latent nature of the growth models used to address the present research questions reinforced the validity of our results, as all models that were computed showed a very good fit to the data. Moreover, we used an objective criterion to assess self-enhancement, namely students' actual academic grades. Further, data were collected on four academic subjects, which reinforces the generalizability of the present results. Additionally, gender and age were controlled for in all of our models.

The present study is not without limitations. First, operationalizing self-enhancement as the difference between self-reported and actual grades has the drawback that students with the best possible grade could not over-report their grade. However, averaged across all school subjects and measurement occasions, only 2.6% of the students had the highest grade (median 2.7%, max. 5.1%, min. 0.2%). Thus this limitation likely had little influence on the obtained results. Second, it must also be noted that the time frame under consideration was limited to two years, and the sample was comprised solely of high-school students. Future studies might examine the effects of self-enhancement on self-concept and achievement across an extended time period and among primary school and university students. Third, despite being relatively large, the present sample was not representative of the Swiss population of ninth- to eleventh-graders, as the French- and Italian-speaking populations of Switzerland were not represented. Additional studies are needed to assess the external validity of the results reported herein.

Further, gender, age, and academic subject were controlled for in the present analyses while other potentially relevant covariates were excluded such as parental education and income (Shaw & Mattern, 2009), time since graduation and ethnicity (Talento-Miller & Peyton, 2006), and genetic and environmental influences (Schwartz & Beaver, 2014). Fourth, the ICC of academic achievement was found to be relatively low (i.e., .05). This result might be due to high homogeneity between high-school classes in our sample or because grading on the curve practices lead to reduced variance between classes. Finally, we did not explore associations across different academic subjects, which would be an important next step as previous findings suggest that associations within an academic subject are different from those across academic subjects (Möller et al., 2011; Niepel et al., 2014).

Conclusion

The present study yielded the first results showing that self-enhancement is associated with a higher academic-self concept in the short term and that this short-term increase might lead to a stronger decrease in achievement over time. An inflated self-concept might lead to unrealistic expectations and less efficient learning strategies or reduced learning efforts, which in turn may lead to lower achievement. If a decrease in achievement is then attributed to external causes, the likelihood of continued self-enhancement increases and a vicious cycle may arise and lead to a decrease in achievement in the long term. Thus, the reciprocal associations between self-enhancement, self-concept, and achievement are highly complex and involve a number of mediating (e.g., attributions) and moderating (e.g., learning effort) variables that need to be examined in more detail.

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Tables and Figures

Table 1

Descriptive Statistics for Self-Reported Academic Achievement, Actual Academic Achievement, Self-Enhancement, and Academic Self-Concept in Mathematics, German, English, and French

	T1 (2012)		T2 (2013)		T3 (2014)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Self-reported Academic Achievement						
Mathematics	4.57	0.74	4.51	0.82	4.50	0.80
German	4.73	0.46	4.70	0.57	4.75	0.57
English	4.71	0.61	4.71	0.65	4.72	0.62
French	4.59	0.69	4.55	0.73	4.48	0.73
Actual Academic Achievement						
Mathematics	4.52	0.75	4.44	0.78	4.42	0.82
German	4.67	0.46	4.66	0.52	4.72	0.54
English	4.65	0.62	4.67	0.62	4.65	0.62
French	4.54	0.68	4.51	0.70	4.44	0.72
Self-Enhancement						
Mathematics	0.08	0.23	0.12	0.30	0.13	0.29
German	0.09	0.22	0.09	0.22	0.11	0.24
English	0.08	0.23	0.09	0.22	0.12	0.28
French	0.09	0.25	0.10	0.28	0.10	0.28
Academic Self-Concept						
Mathematics	3.14	1.10	3.02	1.11	3.01	1.13
German	3.30	0.89	3.20	0.92	3.26	0.97
English	3.41	1.05	3.39	1.04	2.76	1.21
French	3.17	1.09	3.07	1.13	2.90	1.11

Note. *M* = Mean; *SD* = Standard deviation; T1 = Time 1 assessment (*N* = 916); T2 = Time 2 assessment (*N* = 719); T3 = Time 3 assessment (*N* = 647).

Table 2

Zero-order Correlations between All Study Variables for Mathematics (above the diagonal in the upper half of the table), German (below the diagonal in the upper half of the table), English (above the diagonal in the lower half of the table), and French (below the diagonal in the lower half of the table)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
							Mathematics (above the diagonal) and German (below the diagonal)							
1 Sex (male)	1	-.03	.21**	.16**	.16**	.01	-.01	-.05	-.02	-.06	-.03	.03	.08*	-.01
2 Age (years)	-.03	1	.02	-.05	-.03	.04	-.02	-.01	.03	-.02	-.06	.07	.06	.10*
3 ACSC T1	-.19***	-.03	1	.73***	.69***	.74***	.55***	.51***	.71***	.50***	.47***	.04	.15***	.04
4 ACSC T2	-.22***	-.03	.64***	1	.75***	.59***	.71***	.56***	.55***	.69***	.55***	.09*	.12**	-.03
5 ACSC T3	-.25***	-.02	.61***	.74***	1	.56***	.61***	.75***	.57***	.59***	.71***	.01	.13***	.04
6 S-R Grade T1	-.17***	-.01	.62***	.42***	.44***	1	.60***	.58***	.93***	.59***	.56***	.13***	.06	.01
7 S-R Grade T2	-.19***	-.06	.32***	.53***	.51***	.44***	1	.65***	.57***	.86***	.67***	.09*	.35***	-.06
8 S-R Grade T3	-.23***	.04	.32***	.46***	.63***	.42***	.53***	1	.59***	.65***	.88***	.01	.08	.20***
9 Actual Grade T1	-.21***	.01	.55***	.39***	.42***	.85***	.43***	.42***	1	.58***	.58***	-.24***	.05	-.03
10 Actual Grade T2	-.23***	-.03	.36***	.54***	.47***	.44***	.76***	.50***	.47***	1	.66***	.06	-.18***	-.04
11 Actual Grade T3	-.24***	.02	.30***	.40***	.58***	.47***	.52***	.77***	.50***	.53***	1	-.02	.09*	-.29**
12 Self-Enhancement T1	.06	.01	.11***	.06	.04	.26***	.01	-.01	-.29***	-.06	-.04	1	.04	.07
13 Self-Enhancement T2	.02	-.06	.01	.06	.10*	.09*	.48***	.05	.04	-.21***	.02	.08*	1	-.05
14 Self-Enhancement T3	.04	.02	.06	.103*	.11**	-.04	.04	.39***	-.06	-.01	-.29***	.04	.08	1
							English (above the diagonal) and French (below the diagonal)							
1 Male	1	-.03	-.07	-.07	.01	-.13***	-.16***	-.11**	-.16***	-.18***	-.13**	.08*	.01	.06
2 Age	-.03	1	-.02	-.07	.08	.01	-.05	-.08	-.03	-.03	-.12**	.06	.02	.08
3 ACSC T1	-.25***	-.08*	1	.79***	.06	.76***	.59***	.51***	.73***	.59***	.53***	.04	.05	-.02
4 ACSC T2	-.27***	-.09*	.77***	1	.08	.67***	.73***	.59***	.64***	.70***	.57***	.02	.12**	.01
5 ACSC T3	-.32***	-.10*	.72***	.82***	1	.04	.05	.02	.06	.03	-.03	-.05	.02	.07
6 S-R Grade T1	-.23***	-.05	.75***	.63***	.59***	1	.69***	.58***	.91***	.69***	.64***	.16***	.05	-.08
7 S-R Grade T2	-.26***	-.05	.60***	.75***	.71***	.64***	1	.64***	.69***	.86***	.65***	-.05	.34***	-.05
8 S-R Grade T3	-.36***	-.17***	.56***	.64***	.75***	.54***	.65***	1	.57***	.64***	.81***	.01	.03	.29***
9 Actual Grade T1	-.24***	-.09*	.75***	.65***	.60***	.89***	.63***	.53***	1	.72***	.64***	-.27***	.01	-.11*
10 Actual Grade T2	-.26***	-.11**	.60***	.74***	.68***	.63***	.84***	.67***	.65***	1	.67***	-.10**	-.19***	-.04
11 Actual Grade T3	-.34***	-.15**	.59***	.69***	.76***	.60***	.73***	.85***	.65***	.73***	1	-.05	-.03	-.33***
12 Self-Enhancement T1	.03	.05	.01	-.04	.01	.26***	.03	.05	-.21***	-.01	-.05	1	.10*	.08
13 Self-Enhancement T2	.02	.01	.06	.08	.09	.07	.34***	-.02	.03	-.23***	.03	.11***	1	.07
14 Self-Enhancement T3	-.06	-.03	-.03	-.05	.01	-.08	-.08	.31**	-.16***	-.03	-.25***	.14**	-.09	1

Note. ACSC = Academic self-concept; S-R = Self-reported; T1 = Time 1 assessment (N = 916); T2 = Time 2 assessment (N = 719); T3 = Time 3 assessment (N = 647). $^{*}p \leq .05$; $^{**}p \leq .01$; $^{***}p \leq .001$.

Table 3

Model Fit Indices for the Three Univariate LGMs and for the Two TPPLGMs

	χ^2	*df*	*p*	CFI	RMSEA	SRMR
Univariate LGM for Self-Enhancement	0.097	1	.755	1.000	.000	.003
Univariate LGM for Academic Self-Concept	2.454	1	.117	.999	.019	.010
Univariate LGM for Academic Achievement	2.347	1	.125	.998	.019	.015
TPPLGM without Covariates	23.534	9	.005	.997	.020	.019
TPPLGM with Covariates[a]	86.470	24	.001	.988	.027	.018

[a]Gender, age, and academic subject (with mathematics as the reference category) were included as covariates in this model.

Table 4

Correlations between Latent Growth Parameters of the TPPLGM without (above the diagonal) and with Covariates (gender, age, and academic subject; below the diagonal)

	M	*SD*	1	2	3	4	5	6
1 Intercept Self-Enhancement	0.09***	0.10**	1	-.31	.21*	-.28*	.02	-.30
2 Slope Self-Enhancement	0.02**	0.05	-.29	1	-.13	.28	-.23	.20
3 Intercept Self-Concept	3.25***	1.01***	.28*	-.16	1	-.53***	.82***	-.25**
4 Slope Self-Concept	-0.15***	0.38***	-.35*	.42	-.52***	1	-.32***	.83***
5 Intercept Achievement	4.58***	0.54***	.08	-.23	.83***	-.35***	1	-.08
6 Slope Achievement	-0.04**	0.18**	-.29	.24	-.28***	.85***	-.13	1

Note. M = Mean; *SD* = Standard deviation. The mean scores (M) and the standard deviations (SD) of the latent growth parameters refer to the TPPLGM without covariates.

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Table 5

Standardized Regression Coefficients of the Effects of the Covariates on the Latent Growth Parameters

	Self-Enhancement		Self-Concept		Achievement	
	Intercept	Slope	Intercept	Slope	Intercept	Slope
Male	0.21*	-0.04	-0.06***	-0.07*	-0.17***	-0.09*
Age	0.14*	-0.06	-0.03	-0.03	-0.02	-0.13
German	0.03	-0.14	0.07*	0.06	0.12**	0.23**
English	-0.02	-0.05	0.13***	-0.20***	0.11**	0.09
French	0.03	-0.18	0.01	-0.07	0.02	0.01

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

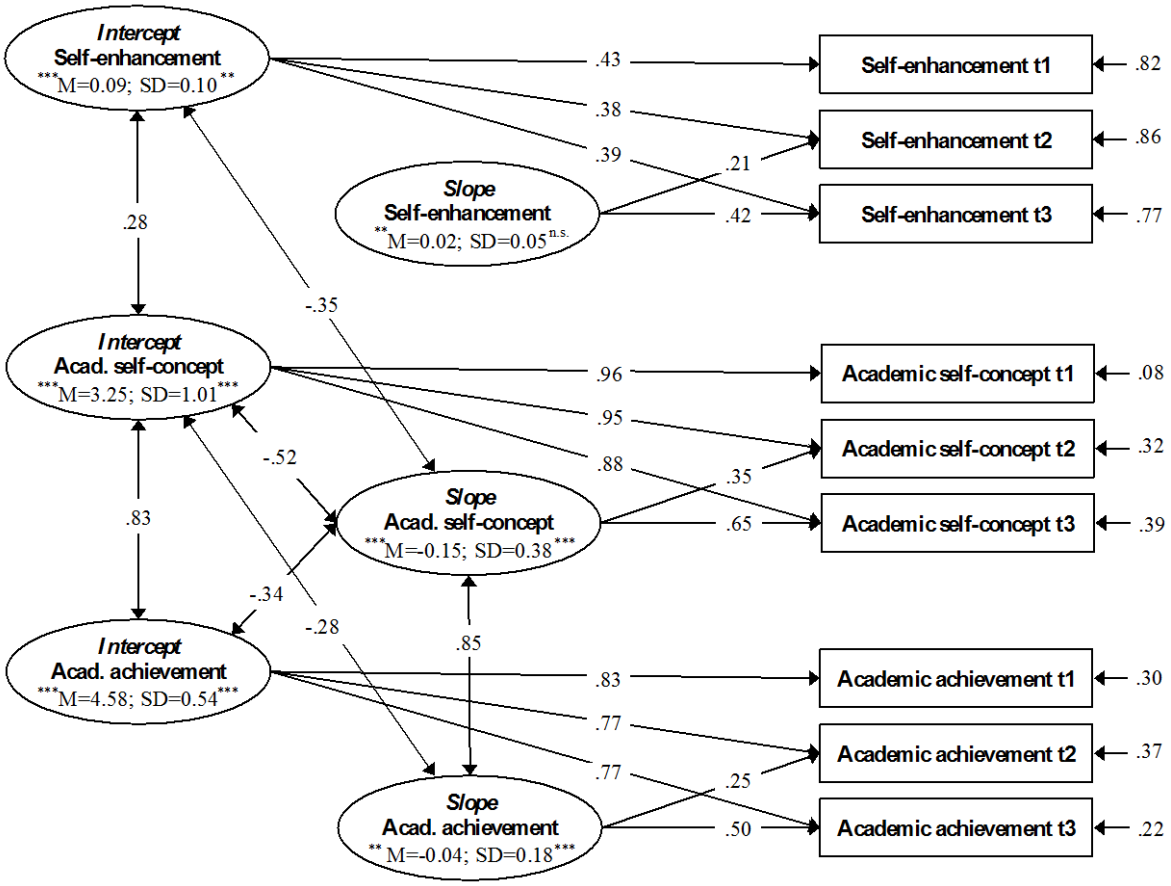

Figure 1. Standardized solution of the TPPLGM with covariates (gender, age, and academic subject). The mean scores (M) and the standard deviations (SD) of the latent growth parameters refer to the TPPLGM without covariates. The mean scores and the standard deviations were included here for a better overview. All correlations between latent growth parameters are indicated with straight double-headed arrows and represent *residual correlations* (i.e., correlations between the variance that was not explained by the covariates). Only significant correlations are displayed.

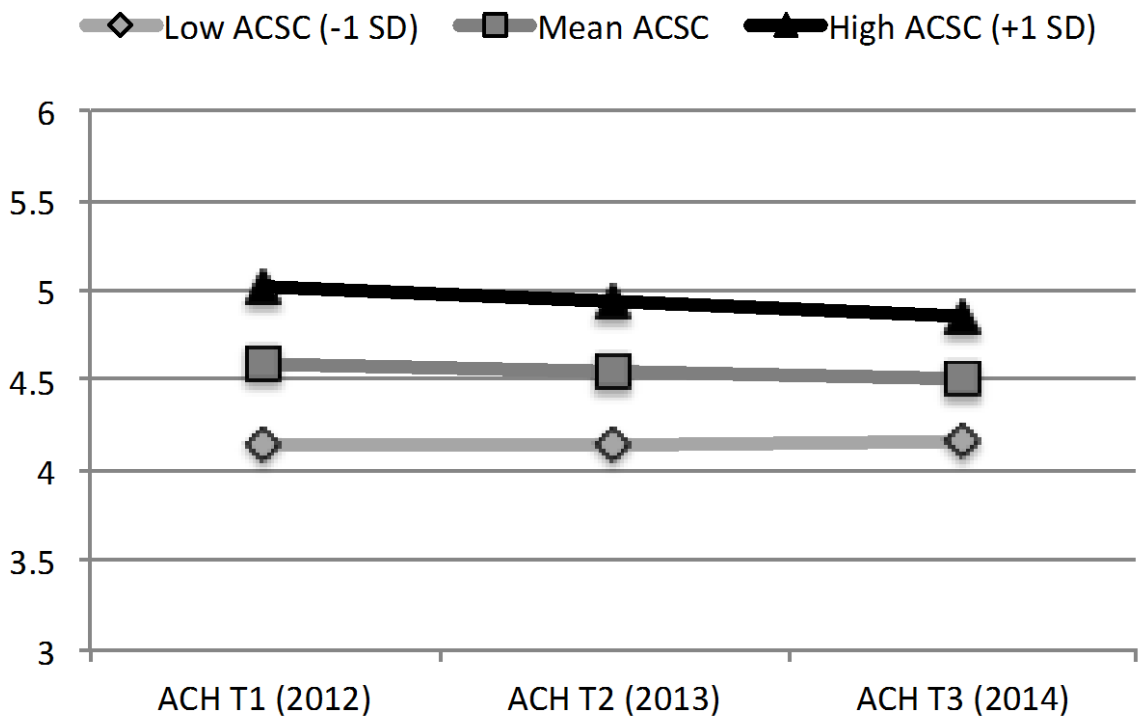

Figure 2. Estimated growth curves of academic achievement (ACH) for students with low (M – 1 SD), mean, and high (M + 1 SD) initial scores of academic self-concept (ACSC).

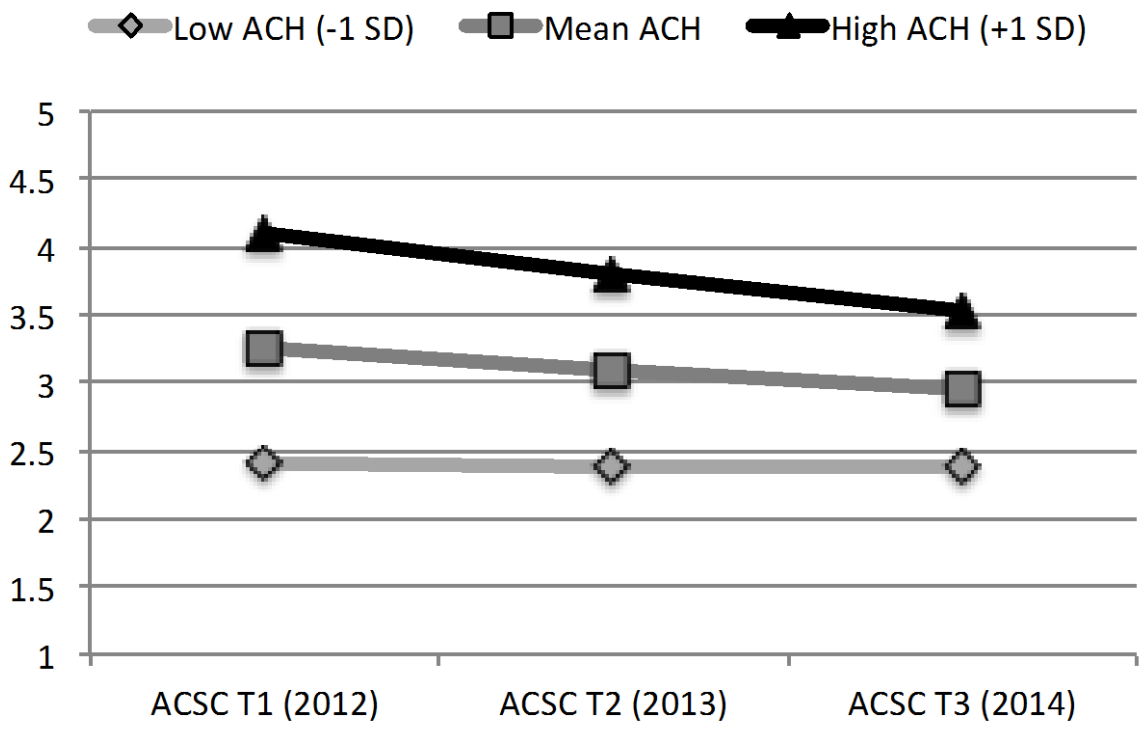

Figure 3. Estimated growth curves of academic self-concept (ACSC) for students with low (M – 1 SD), mean, and high (M + 1 SD) initial scores of academic achievement (ACH).