IMPACT OF STUDENTS’ AND THEIR SCHOOLMATES’ ACHIEVEMENT MOTIVATION ON THE STATUS AND GROWTH IN MATH AND LANGUAGE ACHIEVEMENT OF BOYS AND GIRLS ACROSS GRADES 7 THROUGH 8

Eva VAN DE GAER, Georges VAN LANDEGHEM, Heidi PUSTJENS, Jan VAN DAMME, & Agnes DE MUNTER
Katholieke Universiteit Leuven

The present study focuses not only on the impact of students’ achievement motivation, but also on the influence of achievement motivation of fellow students on status and growth in language and math achievement across Grades 7 and 8. The achievement motivation of schoolmates may create a learning environment that facilitates or impedes learning above and beyond what would be expected on the basis of the individual student’s achievement motivation, intelligence and background characteristics. Data from the LOSO-project, a longitudinal study in secondary education, have been analysed using multilevel linear growth curve modeling. It turns out that the effect of achievement motivation, both of individuals and in groups, should not be neglected in explanations of individual progress in achievement, even when ability and background characteristics such as the socio-economic status, age, sex and home language have been controlled for. In addition, the data suggest that especially boys with poor achievement motivation at the start of secondary education are at risk of falling behind with regard to language achievement in the subsequent years.

Introduction

Compositional effects and achievement

Since the conclusion of Coleman, Campbell, Hobson, McPartland, Mood, Weifeld, and York (1966) that student body characteristics are more impor-
tant factors explaining academic achievement than teacher and school characteristics, there has been a continuing interest among educational researchers in the impact of background characteristics of fellow students on individual academic achievement. Especially the impact of the ability (i.e., intelligence) and to a lesser extent the impact of the socio-economic status of class and schoolmates on academic achievement has received a lot of attention (Hanushek, Kain, Markman, & Rivkin, 2003; Ireson, Hallam, Hack, Clark, & Plewis, 2002; Kerckhoff, 1986). Research on ability grouping, for instance, has shown that students in high ability (class) groups achieved higher than students in low ability class groups (e.g., Gamoran, Nystrand, Berends, & LePore, 1995). The effect of classmates’ ability over and above the effect of an individual’s ability on academic achievement is also called a compositional or contextual effect. Generally speaking, a compositional or contextual effect can be defined as the effect of a group level (e.g., a class or a school) aggregate variable of an individual level variable over and above the effect of the same individual level variable on a certain outcome variable (Burns & Mason, 2002; Harker & Tymms, 2004). The present study addresses the question whether the achievement motivation of schoolmates is an important predictor – over and above the individual’s achievement motivation – of academic achievement during early adolescence.

Schools and classes are important social environments where students socially interact with each other, make friends, and influence each other as in peer groups. Therefore, it is not surprising that class and school peers exert a strong influence on achievement beliefs and behaviour, especially in early adolescence, during which the influence of peers and the need to be accepted by peers is strong (Ryan, 2001). “Although the processes through which peers and friends influence each other are not fully understood, […] the desire to affiliate with friends and peers can undermine, enhance, or have little effect on motivation and achievement. Much depends on the academic and motivational orientations of the friends and peers with whom students wish to affiliate” (Urdan & Schoenfelder, 2006, p. 342). Research has indeed demonstrated that students whose friends cared more about school learning and achievement had better outcomes than students whose friends showed little interest in learning (Berndt, 1999; Chen, 1997). Based on these findings, we expect that students will achieve higher in schools composed of students with higher achievement motivation. Moreover, we expect that this will be true even after controlling for individual students’ achievement motivation (and background characteristics), i.e., that we will find a compositional (or contextual) effect. The achievement motivation of class and schoolmates may create a learning ‘climate’ or a learning ‘culture’ that facilitates or impedes learning above and beyond what would be expected on the basis of the individual student’s achievement motivation and background characteris-
tics. Dar and Resh (1994) suggest three (mediating) mechanisms through which group composition impact student learning. Although these mechanisms have been proposed, mainly to explain compositional effects, such as, ability grouping and socio-economic grouping, they can also be applied to the explanation of the compositional effect of achievement motivation. A first mechanism involves peer context. Differences between classes and schools in the mean achievement motivation of its members are associated with different peer contexts that may enhance or impede student learning. In educational settings, such as, schools and classes students use their peers as a normative reference group and through processes of socialisation and peer pressure, students internalise the values and norms of the educational setting (Barth, Dunlap, Dane, Lochman, & Wells, 2004; Wilkinson, Hattie, Judy, Townsend, Fung, Ussher, Thrupp, Lauder, & Robinson, 2000). Schools and classes consisting of students with high/low levels of achievement motivation may promote these high/low levels of achievement motivation in individual students that may, in turn, have positive/negative effects on students’ academic achievement (e.g., Berndt, 1999; Chen, 1997; Ryan, 2001). Second, teachers may have higher expectations of class groups and schools consisting of students with higher levels of achievement motivation. These expectations may impact their teaching styles and teachers’ behaviour and indirectly students’ academic achievement. Third, in schools and classes consisting of students with high levels of achievement motivation, it may be possible for teachers to use more effective teaching styles. They may be able to cover more subject matter in highly than in poorly motivated classes, because less time is wasted on maintaining discipline and on keeping the students’ attention focused. Thus, students may learn more in highly than in poorly motivated classes and schools because the time spent on teaching is higher.

**Achievement motivation, gender, and academic achievement**

Achievement motivation is considered as one of the crucial determinants of student achievement and academic success (Anderman & Anderman, in press). Over the past decades, the concept of motivation has been studied extensively, leading to various terminologies and diverse perspectives that emphasise different aspects of motivation, such as, the expectancy-value theory (Atkinson, 1964; Eccles, Adler, Futterman, Goff, Kaczala, Meece, & Midgley, 1983), self-efficacy theory (Bandura, 1997), self-determination theory (Deci & Ryan, 1985), attribution theory (Weiner, 1985) and goal theory (Maehr & Anderman, 1993). For an overview of the different perspectives, we refer to Pianta (2006). The present study builds on Atkinson’s theory of achievement motivation (1964) that was one of the first comprehensive theories on achievement motivation that combined the constructs of needs,
According to Atkinson’s theory (1964), achievement behaviour is defined as the resultant of the emotional conflict between two tendencies, namely, achievement motivation or the tendency to approach success and fear of failure or the tendency to avoid failure. He proposed an orthogonal, two dimensional model in which individuals can be placed on high versus low on both tendencies. These tendencies are determined by a need for achievement/need to avoid failure, which are considered as relatively stable dispositions that vary between individuals, by the subjective probability of success/failure, and by the incentive value of success/failure. This means that in achievement situations, both needs are energised and together with the subjective probability of success/failure and the incentive value of success/failure they determine the (level of the) tendency to approach success and the (level of the) tendency to avoid failure. The present study focuses on the tendency to approach success or on achievement motivation. Although more recently theorists introduced an achievement goal approach to achievement motivation (e.g., Maehr & Anderman, 1993), Atkinson’s theory nowadays remains very important not in the least because of its applicability within the educational setting and particularly within student coaching, such as, prevention and remediation of fear of failure.

With this study, we would like to contribute to the understanding of the role that students’ achievement motivation and that of fellow students play in the explanation of academic achievement during the early years of adolescence. We will focus on language as well as math achievement and we will study the effect of achievement motivation not only on current achievement, but also on the progress students make across Grades 7 and 8. This approach is in keeping with the insight that progress (or growth) is a more important indicator of educational success and effectiveness than students’ achievement at some single point in time (Teddlie & Reynolds, 2000). In an era of increased accountability of schools and teachers, it is important to realise that, for example, secondary education teachers and schools should not be held responsible for students’ status at entry of secondary education but rather for the progress students make during their watch. We will investigate the effect of achievement motivation on status and growth in language and math achievement on top of the effect of students’ intelligence and background characteristics, such as gender, age, socio-economic status, and language spoken at home.

We also focus on the role achievement motivation may play in the explanation of the language and math achievement gap between boys and girls. It has been well documented that girls, on the whole, have higher achievement motivation and that they – in general – show more positive attitudes towards schooling than boys. For instance, girls spend more time on their homework, show less disruptive behaviour in class, and are more concentrated in the class.
Boys’ less positive motivational orientations are considered as one of the crucial determinants of the explanation of boys’ underachievement (Meece, Glienke, & Burg, 2006). Over the past two decades, there has been a growing concern among educational researchers and policy makers about boys’ (under)achievement and attainment. Since the 1970s, girls’ and women’s level of educational participation and occupational status has improved considerably. Nowadays, more girls than boys enter university and colleges. Girls receive more academic honours and earn higher grades at school (Gorard, Rees, & Salisbury, 2001; Kleinfeld, 1999; Yates, 1997). Interestingly, over the past 30 years, girls continue to excel boys in reading and writing tests but the large gender gap in favour of boys in math has decreased or even closed (Cole, 1997). Research has shown that in early adolescence (i.e., middle school level), either no gender differences in math achievement or gender differences in favour of girls are found, whereas boys catch up with and overtake girls at high school and college levels (Johnson, 1996). One of the possible explanations of this age trend is the change in curriculum or math content area across secondary education. During the early years, the emphasis is on math skills, such as calculation and algebra, in which girls excel whereas during the final years of secondary education, the emphasis is more on geometry and mathematical reasoning and problem solving tasks, where boys stand out (De Corte, Janssen, Verschaffel, Knoors, & Colémont, 1999; Penner, 2003; Willingham, Cole, Lewis, & Leung, 1997). Based on these findings, we expect that girls will achieve higher in language as well in math during Grades 7 and 8. If achievement motivation plays an important role in the explanation of the gender gap in language and math achievement, we expect that by controlling for achievement motivation the gender gap in language and math achievement will be reduced or even become non-significant.

Research hypotheses

The main goal of the present study is to gain more insight into the effect of students’ achievement motivation and that of their schoolmates on the status and growth in language and math achievement during the first two Grades of secondary education (i.e., Grades 7 and 8). A second goal is to examine the role of achievement motivation in the explanation of the gender gap in language and math achievement. The main research hypotheses are:

1) Achievement motivation predicts status and growth in language and math achievement across Grades 7 and 8 in addition to individual students’
background characteristics and ability.

2) The achievement motivation of fellow students predicts status and growth in language and math achievement on top of individual students’ achievement motivation.

3) When controlling for achievement motivation, the gender gap in language and math achievement (with regard to status and growth) is reduced or even becomes non-significant.

Method

Data

The data used in this study originate from the LOSO-project (longitudinal research in secondary education project) that started in 1990 and followed a cohort of more than 6000 students during secondary school and afterwards (age 12-21) in Flanders, the Dutch speaking part of Belgium (Van Damme & Onghena, 2002). The sample of schools that participated in the project was selected to be representative of Flanders with regard to characteristics such as school size, school type, the curriculum offered, and the participation of both Catholic and Public schools. The students which were enrolled in these schools in the first grade of secondary education (Grade 7) for the first time in 1990 constituted the LOSO-cohort. The present study focuses on the first two Grades of secondary education, namely, Grade 7 (age 13) and Grade 8 (age 14). The data set consisted of 4340 students (2297 girls and 2043 boys) in 57 schools. Only students who stayed within the same school during Grade 7 and Grade 8, who did not repeat a Grade in the first two years of secondary education, and who were enrolled in the A-curriculum1 were considered. We applied these data restrictions in order to control for possible confounding factors associated with students who change schools, who are retained, or who follow different curricula. Because missing data on the dependent variable can be accommodated within multilevel growth curve models, students were not excluded on the basis of missing data on language and math achievement.

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1 In Grade 7 and 8, students can follow two different curricula, the A-and the B-curriculum. The A-curriculum is academically orientated, while the B-curriculum is vocationally orientated. The B-curriculum is the only option for students who have not been able to obtain the primary education certificate.
Variables

Language and math achievement

Language and math achievement were measured at three different points in time, namely: at the beginning of Grade 7, at the end of Grade 7, and at the end of Grade 8. Because there are no national exams in Flanders, the tests were constructed specifically for the LOSO-project. The language achievement tests were composed of curriculum-relevant multiple-choice items covering spelling, reading comprehension, vocabulary, and metaphors. All three tests showed high internal consistencies (Cronbach’s $\alpha$ ranged from .90 to .93). The math achievement tests were composed of multiple-choice items that tapped number theory, geometry, and set theory, and showed acceptable internal consistencies (Cronbach’s $\alpha$ ranged from .70 to .90). In order to compare the achievement scores over time, test scores were calibrated by IRT-analyses using BIMAIN (Zimowski, Muraki, Mislevy, & Bock, 1994). This resulted in IRT-scores for language and math achievement that refer to the same scale on each of the three measurement occasions.

Student-level variables

Intelligence. At the start of secondary education, the Getlov-intelligence test, which has a high internal consistency (Cronbach’s $\alpha = .82$) and a strong validity (see Lancksweerdt, 1990), was administered to all students. We used the global intelligence score as a covariate in the analyses.

Socio-economic status. A factor analysis was carried out on six variables that were derived from the parents’ questionnaire administered at the beginning of secondary education. These variables include the educational and the occupational level of mother and father, the monthly income, and the cultural capital of the family as indicated by the number of cultural activities, such as, reading and going to the theatre. On the basis of the Scree-test of Cattell and the criterion ‘eigenvalue is greater than one’, one factor was selected that was interpreted as the ‘socio-economic status’ (SES). This factor explained 54% of the total variance and all six variables showed a high loading on the factor component. The factor scores were used as the values for the variable ‘socio-economic status’.

Language spoken at home. A distinction was made between families who only speak Dutch at home (code = 1) and families who speak another language at home (code = 0). In the data set, the majority (93%) of the students only speak Dutch at home.

Gender. Gender was dummy coded with ‘0’ for boys and ‘1’ for girls. The data set consisted of 53% girls and 47% boys.

Age. Age was coded as ‘1’ for students who entered secondary education at the normal age of 12. It was coded ‘0’ for the students who had fallen
behind by one or more years before their start in secondary education. Only a small percentage of the students (6%) in the data set were already behind at entry of secondary education.

*Achievement motivation.* Achievement motivation was measured by the Achievement Motivation test for Children, which is a Flemish adaptation of the Dutch version of Hermans (1983). Hermans (1983) defines achievement motivation as a relatively stable trait leading to the willingness to excel in achievement tasks. Although besides achievement motivation, also fear of failure and the tendency to give socially approved answers were measured by means of the same questionnaire, the present study only uses the subtest ‘Achievement Motivation’. This subtest has a high internal consistency (Cronbach’s $\alpha = .82$) and a high validity, as indicated by the high correlation with enjoyment of studying and learning. As individual students’ achievement motivation is central to the present study, we have listed in Appendix A (a translation of) the 29 items on which the achievement motivation scale is based.

School-level variables

At the school level, aggregated measures of the six student-level explanatory variables were constructed. For each school, we calculated the mean score of the six student-level variables of all the students in that school. By this means, we created a measure of the school public’s intelligence, the school public’s socio-economic status, the proportion of girls, of normally progressing students, and of Dutch-speaking students in each school, and finally, the school public’s academic motivation. To make a distinction between the student-level variables and the school-level aggregated variables, the prefix “SCH-” is used to denote the aggregated variables.

*Analytical approach*

Multilevel (linear) growth curve models were estimated for math and language achievement separately using the MLwiN software (Rasbash, Browne, Goldstein, Yang, Plewis, Healy, Woodhouse, Draper, Langford, & Lewis, 2000). Three-level models were fitted, with level 1 referring to the measurement level, level 2 to the student level, and level 3 to the school level. They represent the development over time in math and language achievement. An intercept and a linear slope are allowed to vary between students and between schools. This means that for each student and for each school a linear growth curve was estimated that can be characterised by, respectively, an individual specific and a school specific intercept (i.e., status) and slope (i.e., growth or rate of change). The beginning of Grade 7 was chosen as the reference point, meaning that the intercept or status refers to the math and language achieve-
ment at the start of secondary education. The linear slope represents the growth or the progress in math and language achievement of students and schools during Grades 7 and 8. Predictors at level 2 included students’ background characteristics – namely: the socio-economic status, gender, language spoken at home, and age –, students’ ability (i.e., intelligence), and students’ achievement motivation. The aggregated school-level measures served as predictors at level 3. In order to investigate whether these predictors were associated with growth or progress in language and math achievement, the interactions between each of the predictors and the time variable were included. All non-dichotomous predictors were grand mean centred to facilitate the interpretation of the intercept (Singer & Willett, 2003). All models assumed that the measurement errors were homoskedastic and uncorrelated across time. The percentage of variance explained at the student or at the school level by including a student-level or school-level variable was used as an indicator of effect size.

Results

Effect of achievement motivation, intelligence, and background characteristics on status and growth in language and math achievement (Hypothesis 1)

Table 1 and 2 present the unconditional linear growth curve model (Model 1) and the linear growth model including the effects of students’ achievement motivation (Model 2), intelligence (Model 3), and background characteristics (Model 4) for language and math achievement, respectively. The unconditional growth curve model estimates the linear growth curves (i.e., initial status and rate of change or slope) for language and math achievement, the variances, and covariances at the student and school level. According to Model 1, the students made – on average – no significant progress in language achievement whereas they did make significant progress in math achievement across Grades 7 and 8 (see: the rate of change in Model 1, Table 1 and 2). Both for language and math achievement, there were significant differences in initial status and in rate of change between students within schools as well as between schools (Model 1, see Table 1 and 2). These differences were reduced considerably when students’ achievement motivation, intelligence, and background characteristics were taken into account.

In a first step, we added achievement motivation to the unconditional linear growth curve model (Model 2 in Table 1 and 2). Students’ achievement motivation was significantly positively related to the initial status and the rate of change in language achievement. The same conclusion holds in the case of math achievement. But in terms of the reduction of variance components
which can be seen as an effect size measure – the effect of the latter relationship proves to be very small. For language achievement, there was a small (4%) reduction of the variance in the rate of change, both at the student level and at the school level.

In a next step, students’ intelligence was taken into account (Model 3 in Tables 1 and 2). It reduced the variance in initial status between students (within schools) considerably, by about three fifths (60%) for language and more than three quarters (76%) for math achievement. Moreover, the variance in initial status between schools was reduced by more than three quarters for both language (76%) and math achievement (78%). This means that students’ intelligence is a strong predictor of the initial status of the language and math achievement at the start of secondary education and that schools differ in the type of students (highly intelligent or less intelligent) they attract at the beginning of secondary education. In contrast, the students’ intelligence is not significantly related to their growth in language achievement. But for math achievement, there is a significant relationship between intelligence and growth: Students with lower intelligence scores made significantly more progress; by adding the intelligence score as a predictor of the rate of change in math achievement, its student-level variance was reduced by a quarter (25%), leaving the remainder not significantly different from zero (Model 3 in Table 2).

In a final step, students’ background characteristics (see Model 4) were added. This reduced the student-level variance in initial status further for both language (4%) and math achievement (1%). In addition, the school-level variance in initial status was reduced further with 8% and 3% for language and math achievement, respectively. All the student-level background

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2 We use the amount of reduction of variance (components) to measure the size of the effect of (groups of) predictors. When we quantify the reduction of a variance component – to supplement qualitative descriptions such as ‘small’, ‘considerable’, ‘important’ – the size of the corresponding component in Model 1 (see Tables 1 and 2) is used as the basis for comparison. Consecutive estimates of the between-school variance of the initial status of language achievement (Table 1), for example, are: 0.206 (Model 1), 0.206 (Model 2), 0.049 (Model 3) and 0.033 (Model 4); consequently, we say that in the transition from Model 1 to Model 2 (i.e., by adding the individual achievement motivation variable as a predictor) there is no reduction of variance, as 

$$(0.206 - 0.206) / 0.206 = 0\%$$

in the transition from Model 2 to Model 3 (i.e., the addition of individual intelligence) the component is reduced by 

$$(0.206 - 0.049) / 0.206 = 76\%$$

in the transition from Model 3 to Model 4 (addition of individual background variables) the component is further reduced by 

$$(0.049 - 0.033) / 0.206 = 8\%.$$ 

A disadvantage of a description such as ‘a 76% reduction of the variance’ is that it may invite an overly optimistic impression of high accuracy. Bearing in mind the standard errors of the variance component estimates involved, the latter description should probably rather be interpreted as ‘a reduction of the variance by three quarters’. Finally, note that other quantifications of the reduction of variance components are sometimes used, for example with as a basis of comparison the total variance or the variance components of the previous model in the sequence.
characteristics except age were significantly positively related to language achievement at the beginning of Grade 7; for math achievement at the beginning of Grade 7 only the effect of gender was not statistically significant. The students’ background characteristics reduced the variance in rate of change at the student level with 17% and 13%, and at the school level with 16% and 12% for language and math achievement, respectively. This further reduction in the rate of change in language achievement can be chiefly attributed to the effect of gender and the effect of the language spoken at home whereas for math achievement, also the socio-economic status was important. As expect-

### Table 1.
Effect of Students’ Achievement Motivation, Intelligence, and Background Characteristics on Status and Rate of Change in Language Achievement.

|                        | Language achievement |                  | Model 1 | Model 2 | Model 3 | Model 4 |
|------------------------|----------------------|------------------|---------|---------|---------|---------|
|                        |                      |                  | β       | SE      | β       | SE      | β       | SE      |
| Fixed                  |                      |                  |         |         |         |         |         |         |
| Initial status         | intercept            |                  | 0.252   | ***     | 0.168   | ***     | 0.166   | ***     | 0.032   | **      | 0.063   |                   |
|                        | achievement motivation|                  | 0.006   | **      | 0.002   | ***     | 0.006   | ***     | 0.001   | 0.005   | ***     | 0.032   | 0.048   |
|                        | intelligence         |                  | 0.041   | ***     | 0.001   | 0.038   | ***     | 0.001   |         |         |         |         |
|                        | SES                  |                  |         |         | 0.040   | ***     | 0.038   | ***     | 0.001   |         |         |         |
|                        | gender               |                  |         |         | 0.126   | ***     | 0.134   |         |         |         |         |
|                        | age                  |                  |         |         | 0.138   |         | 0.134   |         |         |         |         |
|                        | language spoken at home|              |         |         | -0.016  | -0.016  | -0.017  | -0.017  | -0.032  | -0.008  | 0.04    |         |         |
| Rate of change         | intercept            |                  | -0.013  |         | 0.033   |         | 0.016   |         | 0.015   |         | 0.04    |         |         |
|                        | achievement motivation|                  | 0.005   | ***     | 0.001   | 0.005   | 0.005   | ***     | 0.001   | 0.004   | ***     | 0.001   |         |
|                        | intelligence         |                  |         |         | 0.001   |         | 0.002   | *       | 0.001   |         |         |         |
|                        | SES                  |                  |         |         | 0.004   |         | 0.003   |         |         |         |         |
|                        | gender               |                  |         |         | 0.152   | ***     | 0.144   |         |         |         |         |
|                        | age                  |                  |         |         | 0.024   |         | 0.023   |         |         |         |         |
|                        | language spoken at home|              |         |         | -0.122  | ***     | 0.023   |         |         |         |         |
| Random                 | initial status       |                  | 0.206   | ***     | 0.042   | 0.206   | 0.049   | ***     | 0.049   | 0.041   | 0.206   | 0.049   | 0.049   |
|                        | covariance           |                  | 0.033   | *       | 0.016   | 0.031   | 0.016   | *       | 0.017   | 0.008   | 0.011   | 0.006   | 0.006   |
|                        | rate of change       |                  | 0.056   | ***     | 0.011   | 0.054   | 0.011   | 0.053   | ***     | 0.011   | 0.044   | ***     | 0.009   |
| Student level          | initial status       |                  | 0.269   | ***     | 0.010   | 0.268   | 0.010   | 0.106   | ***     | 0.007   | 0.095   | ***     | 0.007   |
|                        | covariance           |                  | 0.032   | ***     | 0.004   | 0.031   | 0.004   | 0.027   | ***     | 0.004   | 0.025   | ***     | 0.004   |
|                        | rate of change       |                  | 0.023   | ***     | 0.003   | 0.022   | 0.003   | 0.022   | ***     | 0.003   | 0.018   | ***     | 0.003   |
| Measurement level      | initial status       |                  | 0.192   | ***     | 0.004   | 0.192   | 0.004   | 0.192   | ***     | 0.004   | 0.192   | ***     | 0.004   |
| Deviance               |                      |                  | 24148.60|         | 24097.84|         | 21660.44|         | 21222.01|         |         |         |         |

*p < .05, ** p < .01, *** p < .001
We can conclude that achievement motivation has an independent effect on the status and rate of change in language and math achievement because it remained significant when controlling for students’ intelligence and background characteristics (Tables 1 and 2). Although its effect was smaller than the effects of intelligence and background characteristics, consistent positive effects have been demonstrated.
Compositional effects of achievement motivation on status and growth in language and math achievement (Hypothesis 2)

In a first step, we tested whether the achievement motivation of schoolmates influenced status and growth in language and math achievement over and above the effect of students’ achievement motivation, ability and background characteristics. The results are shown in Table 3 and 4 for language and math achievement, respectively (see Model 5). For language but not for math achievement schoolmates’ achievement motivation was a significant predictor; more specifically it predicts the rate of change in language achievement. This means that students with similar ability, background characteristics, and achievement motivation make more progress in language achievement in schools composed of students with high achievement motivation than in schools with a lower average achievement motivation. The variance of the rate of change in language achievement at the school level was reduced by 14%. No significant association was found between schoolmates’ achievement motivation and language achievement at the start of secondary education (i.e., status).

In a next step, we first added the school public’s ability (Model 6) and then the school public’s background characteristics (Model 7) to Model 5, to investigate whether the compositional effect of achievement motivation remains significant when taking into account other compositional effects. The final model (Model 7) in Table 3 shows that it does. Apart from the average achievement motivation in the school, the percentage of schoolmates having entered secondary education at the normal age was a significant predictor – with a positive coefficient – of individual growth in language achievement. Moreover, the school average intelligence proved to be positively related to language achievement at the start of secondary education. Its introduction (Model 6) reduced the school-level variance in initial status further by 9%, whereas the addition of the schoolmates’ age (Model 7) reduced the school-level variance in rate of change by 4%.

With regard to math achievement, there is no evidence of a significant association between average achievement motivation in the school and the initial status or the growth of achievement in the Models 5 and 6 (Table 4). In contrast, Model 7 – which includes the average background characteristics – suggests a negative relationship between schoolmates’ achievement motivation and the rate of change in math achievement. The latter effect, however, we interpret as a statistical artefact. This point of view is supported by Model 8 (Table 4), which is different from Model 7 in that it only includes the school-level variables that were significantly related to math achievement in Models 6 or 7. In Model 8, which does not fit the data worse than Model 7 according to a deviance test (Snijders & Bosker, 1999, p. 88), the effect of
Table 3.
Compositional Effects of Achievement Motivation, Intelligence, and Background Characteristics on Status and Rate of Change in Language Achievement.

|                     | Model 5 |         | Model 6 |         | Model 7 |         |
|---------------------|---------|---------|---------|---------|---------|---------|
|                     | β       | SE      | β       | SE      | β       | SE      |
| **Fixed**           |         |         |         |         |         |         |
| Initial status      |         |         |         |         |         |         |
| intercept           | -0.126  | **0.048** | -0.135  | **0.044** | -0.133  | **0.044** |
| achievement motivation | 0.005  | ***0.001** | 0.005  | ***0.001** | 0.005  | ***0.001** |
| intelligence        | 0.038  | 0.038  | 0.038  | 0.038  | 0.038  | 0.038  |
| SES                 | 0.040  | 0.039  | 0.034  | 0.039  | 0.034  | 0.039  |
| gender              | 0.125  | 0.134  | 0.020  | 0.128  | 0.020  | 0.128  |
| age                 | 0.138  | 0.132  | 0.034  | 0.129  | 0.034  | 0.129  |
| language spoken at home | 0.123  | 0.107  | 0.033  | 0.109  | 0.033  | 0.109  |
| SCH-achievement motivation | 0.028  | 0.028  | 0.018  | 0.028  | 0.018  | 0.028  |
| SCH-intelligence    |         |         | 0.019  | 0.002  | 0.015  | *0.007  |
| SCH-SES             |         |         | -0.018 | 0.036  |         |         |
| SCH-gender          |         |         | 0.049  | 0.066  |         |         |
| SCH-age             |         |         | 0.525  | 0.357  |         |         |
| SCH-language spoken at home | -0.146 | 0.166  |         |         |         |         |
| Rate of change      |         |         |         |         |         |         |
| intercept           | -0.010  | 0.038  | -0.010  | 0.038  | -0.007  | 0.038  |
| achievement motivation | 0.004  | **0.004** | 0.004  | **0.004** | 0.004  | **0.004** |
| intelligence        | 0.002  | 0.002  | 0.001  | 0.002  | 0.001  | 0.002  |
| SES                 | 0.003  | 0.004  | 0.003  | 0.004  | 0.003  | 0.004  |
| gender              | 0.151  | 0.149  | 0.014  | 0.149  | 0.014  | 0.149  |
| age                 | 0.024  | 0.026  | 0.023  | 0.025  | 0.023  | 0.025  |
| language spoken at home | -0.121 | -0.118 | 0.023  | -0.119 | 0.023  | -0.119 |
| SCH-achievement motivation | 0.059  | **0.059** | 0.059  | **0.059** | 0.049  | *0.022  |
| SCH-intelligence    | 0.003  | 0.003  | 0.003  | 0.003  | 0.003  | 0.003  |
| SCH-SES             |         |         | -0.033 | 0.05  |         |         |
| SCH-gender          |         |         | 0.021  | 0.093  |         |         |
| SCH-age             |         |         | 0.931  | *0.473 |         |         |
| SCH-language spoken at home | -0.043 | 0.214  |         |         |         |         |
| **Random**          |         |         |         |         |         |         |
| School level        |         |         |         |         |         |         |
| initial status      | 0.032  | ***0.032** | 0.013  | **0.013** | 0.003  | **0.012** |
| covariance          | 0.007  | 0.005  | 0.007  | **0.007** | 0.004  | *0.001** |
| rate of change      | 0.036  | 0.036  | 0.036  | 0.034  | 0.036  | 0.034  |
| Student level       |         |         |         |         |         |         |
| initial status      | 0.095  | **0.095** | 0.095  | **0.095** | 0.095  | **0.095** |
| covariance          | 0.025  | 0.025  | 0.025  | 0.025  | 0.025  | 0.025  |
| rate of change      | 0.018  | 0.018  | 0.018  | 0.018  | 0.018  | 0.018  |
| Measurement level   |         |         |         |         |         |         |
| initial status      | 0.192  | ***0.192** | 0.192  | **0.192** | 0.192  | **0.192** |
| covariance          | 0.004  | 0.004  | 0.004  | 0.004  | 0.004  | 0.004  |

* $p < .05$, ** $p < .01$, *** $p < .001$
Table 4.
Compositional Effects of Achievement Motivation, Intelligence, and Background Characteristics on Status and Rate of Change in Math Achievement.

| Fixed                          | Model 5 | Model 6 | Model 7 | Model 8 |
|-------------------------------|---------|---------|---------|---------|
| intercept                     | 0.060   | 0.048   | 0.060   | 0.045   |
| achievement motivation        | 0.004   | 0.001   | 0.004   | 0.001   |
| intelligence                  | 0.041   | 0.001   | 0.040   | 0.001   |
| SES                           | 0.025   | 0.004   | 0.024   | 0.004   |
| gender                        | -0.014  | 0.020   | -0.010  | 0.020   |
| age                           | 0.153   | 0.034   | 0.147   | 0.034   |
| language spoken at home       | -0.066  | 0.033   | -0.081  | 0.033   |
| SCH-achievement motivation    | 0.026   | 0.018   | -0.004  | 0.015   |
| SCH-intelligence              | 0.015   | 0.003   | 0.014   | 0.008   |
| SCH-SES                       | 0.048   |         |         | 0.040   |
| SCH-gender                    | -0.075  |         |         | 0.075   |
| SCH-age                       | 0.053   |         |         | 0.395   |
| SCH-language spoken at home  | -0.277  | 0.184   | -0.395  | 0.175   |
| Rate of change                |         |         |         |         |
| intercept                     | 0.178   | 0.037   | 0.178   | 0.037   |
| achievement motivation        | 0.004   | 0.001   | 0.004   | 0.001   |
| intelligence                  | -0.004  | 0.001   | -0.004  | 0.001   |
| SES                           | 0.008   | 0.003   | 0.008   | 0.003   |
| gender                        | 0.065   | 0.014   | 0.064   | 0.014   |
| age                           | -0.005  | 0.025   | -0.004  | 0.025   |
| language spoken at home       | -0.083  | 0.024   | -0.081  | 0.024   |
| SCH-achievement motivation    | -0.004  | 0.015   | -0.005  | 0.016   |
| SCH-intelligence              | 0.001   | 0.003   | 0.009   | 0.007   |
| SCH-SES                       | -0.047  |         |         | 0.038   |
| SCH-gender                    | 0.212   | 0.069   | 0.186   | 0.070   |
| SCH-age                       | 0.374   |         |         | 0.360   |
| SCH-language spoken at home  | -0.448  | 0.166   | -0.09   | 0.108   |
| Random                        |         |         |         |         |
| School level                  |         |         |         |         |
| initial status                | 0.033   | 0.007   | 0.018   | 0.005   |
| covariance                    | -0.003  | 0.004   | -0.004  | 0.003   |
| rate of change                | 0.023   | 0.005   | 0.023   | 0.005   |
| Student level                 |         |         |         |         |
| initial status                | 0.050   | 0.007   | 0.050   | 0.007   |
| covariance                    | 0.037   | 0.004   | 0.037   | 0.004   |
| rate of change                | 0.005   | 0.004   | 0.005   | 0.004   |
| Measurement level             |         |         |         |         |
| Deviance                      |         |         |         |         |

* $p < .05$, ** $p < .01$, *** $p < .001$
the average achievement motivation in the school is no longer statistically
different from zero. We suspect that the data are not sufficiently powerful to
yield reliable estimates of individual coefficients from this block of mutually
correlated school-level variables – see Table 5 –, when they are introduced
in an already complex model.

Achievement motivation and gender differences in trajectories for math and
table 5

|                  | 1  | 2    | 3    | 4    | 5    | 6    |
|------------------|----|------|------|------|------|------|
| SCH-intelligence | 1.00 |      |      |      |      |      |
| SCH-SES          | 0.88 *** | 1.00 |      |      |      |      |
| SCH-gender       | -0.06 | -0.01 | 1.00 |      |      |      |
| SCH-language spoken at home | 0.73 *** | 0.58 *** | -0.08 | 1.00 |      |      |
| SCH-age          | 0.93 *** | 0.84 *** | 0.01 | 0.73 *** | 1.00 |      |
| SCH-achievement motivation | 0.34 * | 0.39 ** | 0.35 ** | 0.01 | 0.33 * | 1.00 |

*p < .05, ** p < .01, *** p < .001
N = 57

Achievement motivation and gender differences in trajectories for math and

Finally, we investigated how achievement motivation may play a role in
the explanation of the gender gap in language and math achievement. In a
first step, we compared the effect of gender in two models: Model A that
included all the student-level variables (i.e., Models 4 in Table 1 and 2) and
Model B omitting the effect of students’ achievement motivation. Because
these two models only differ in the inclusion of the variable achievement
motivation, a comparison of the results reveals to what extent the effect of
gender on the status and rate of change in language and math achievement
changes by taking into account achievement motivation. For language
achievement we found that – by controlling for achievement motivation – the
effect of gender on the status decreased from 0.135 to 0.126, and its effect on
the rate of change from 0.158 to 0.152. Although there was a nominal
increase in the effect of gender on the status in math achievement from
-0.004 to -0.011, the effect of gender remained non-significant. The effect of
gender on the rate of change in math achievement showed a small decrease
(from 0.070 to 0.064). We can conclude that there were only very small
decreases in the effect of gender on language and math achievement by con-
trolling for achievement motivation.

In a second step, we investigated the effect of the interaction between gen-
der and achievement motivation on the status and growth in language and math
achievement. The effect of this interaction on the rate of change in language achievement turned out to be only marginally significant (see Figure 1), $\chi^2(1, N = 4340) = 3.75, p = .0533$, whereas no significant effects of interactions were found for the initial status of language achievement or for math achievement. Figure 1 shows that girls not only achieve more than boys with regard to language at the start of Grade 7, but that they also make more progress during Grades 7 and 8, resulting in an increase in the gender gap in language achievement across Grades 7 and 8. Moreover, the gender gap in language achievement increases more among the less than among the moderately and highly motivated students. Figure 1 clearly shows that especially boys with low achievement motivation are at risk of falling behind in language. On the other hand, weakly motivated girls do not appear to progress less in language achievement than the averagely and highly achievement motivated girls.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{Effects of gender, of achievement motivation, and of their interaction on the rate of change in language achievement}
\end{figure}

\footnote{Again, a deviance-difference test (Snijders & Bosker, 1999, p. 88) was used to assess the significance of the interaction effects.}
Discussion

The main goal of the present study was to examine the importance of the role of individual students’ achievement motivation and of the average achievement motivation of their (school) peers in the explanation of status and growth in language and math achievement. Overall, some evidence was found in support of our hypotheses although the effects were more pronounced in the case of language achievement than with regard to mathematics.

The fact that evidence was found for the effect of achievement motivation of school peers on language but not – or only to a small extent – on math achievement raises questions concerning the generalization of these effects. A possible explanation of this difference is that school-level achievement motivation may only influence math achievement indirectly, through individual students’ achievement motivation, whereas – in addition to a possible indirect effect – a direct effect on language achievement was found. Thus, the absence of a clear relationship between achievement motivation and math achievement in the present study does not necessarily imply that school peers’ achievement motivation does not affect math achievement, but rather that there is no direct effect. As was mentioned previously (see Introduction), the compositional effect of achievement motivation on academic achievement may be mediated by three different mechanisms: (1) through its impact on individual students’ achievement motivation (i.e., peer context), (2) through teachers’ expectations and the use of differentiated teaching styles and practices, and (3) through the more effective time spent on teaching. Based on the findings of the present study, we can conclude that the impact of the achievement motivation of school peers on students’ language achievement was not only mediated by individual students’ achievement motivation because the effect of the achievement motivation of school peers remained significant when students’ achievement motivation was taken into account. In other words, other factors, such as, teachers’ expectations and time spent on teaching may play a role in the explanation of the compositional effect. Although it did not lie within the scope of the present article, a promising future line of research would be to investigate the mediating effects of each of these proposed mechanisms using structural equation modelling techniques in order to gain more insight into the relationship between the achievement motivation of school peers and individual students’ academic achievement.

Another possible explanation of the difference between language and math in the present study may be that school peers represent an overly broad context, preventing the influence of peers’ achievement motivation on math achievement to come out clearly. The achievement motivation of classmates or close friends may be stronger predictors of math achievement. Previous
research has shown that factors that are proximal to the students, such as the class and the teacher, are likely to be more important than more distant factors, such as school characteristics (Stringfield, 1994). Unfortunately, no information on close friendships was available in our data. The complex task of including a class-level in the multilevel growth curve models – taking into account that the Grades 7 and 8 refer to different classes, which implies a two-dimensional (cross-classified) structure at the class level (Raudenbush & Bryk, 2002) – has not been attempted within the framework of the present study, but may represent an interesting line of future research. We decided not to include the class-level in our analyses because we argue that in the present study the contribution of each class to the progress made could not have been modelled adequately. More data points need to be gathered in order to investigate the contribution of each class (and possible class characteristics) on the current achievement and progress made. According to Singer and Willet (2003), three measurement points are needed to adequately estimate linear growth curves. In the present study, the language and math achievement were measured three times across Grades 7 and 8. This means that a linear growth curve can be estimated over these two Grades within the same schools, but that we cannot model the linear growth rate in each Grade or class separately.

Despite these limitations, the present study extends the understanding of the role achievement motivation plays in explaining achievement. In particular, it was demonstrated that individual achievement motivation has an, albeit small, effect on progress in language achievement, and that this effect persists even when intelligence and background characteristics are taken into account (Hypothesis 1). Moreover, it turned out that individual intelligence did not have any additional explanatory power on top of the effect of achievement motivation with regard to growth in language achievement. Evidence was also found for the positive compositional effect of achievement motivation on progress in language achievement (Hypothesis 2). In other words, the achievement motivation of school peers had an effect on progress in language achievement, over and above the effect of individuals’ achievement motivation, intelligence and background characteristics. The effect remained intact even when the school average intelligence and the schoolmates’ background characteristics were added to the model. Among these five additional characteristics of the school composition – the school public’s average intelligence and socio-economic status, the proportion of girls, of normally progressing students, and of Dutch-speaking students – only the proportion of normally progressing students contributed to the prediction of growth in language achievement after the inclusion of the school average of achievement motivation. Our final hypothesis (Hypothesis 3) was not confirmed. When controlling for achievement motivation the gender gap in language and math
achievement remained significant and was reduced only to a very small extent. This means that, although achievement motivation may play a role in the explanation of gender differences, it cannot fully account for the gender differences in language and math achievement. In the case of language achievement, for example, other factors such as gender differences in interest, expectations, self-concept with regard to language, perceived difficulty, and perceived usefulness of the language subject also play a role in the explanation of the gender difference in language achievement (Eccles et al., 1983).

In a further examination of potential effects of the interaction between gender and achievement motivation, a marginally significant interaction effect on growth in language achievement implies that achievement motivation is a more important predictor for the progress of boys than for girls. It also implies that the gender gap is larger among students with poorer achievement motivation and that especially boys with low achievement motivation are at risk of falling behind with regard to language achievement. Thus, the data seem to suggest that boys’ achievement motivation at the beginning of secondary education may be used as an indicator of boys’ future underachievement in language.

In addition, it would be interesting to investigate in a next study the effect of not only achievement motivation but also fear of failure on current achievement and progress made in order to gain more insight into the moderating effect of fear of failure on the relationship between achievement motivation and academic achievement. According to Atkinson (1964), students with high levels of both achievement motivation (AM) and fear of failure (FF) differ motivationally from students with high levels of achievement motivation and low levels of fear of failure. In fact, based on the position in the two-dimensional model (see Introduction), four different motivational patterns have been distinguished: the ‘success-orientated’ individuals (high AM, low FF), the ‘overstrivers’ (high AM, high FF), the ‘failure avoiders’ (low AM, high FF), and the ‘failure acceptance’ (low AM, low FF). Covington and Omelich (1991) found support for Atkinson’s theory and showed that the achievement behaviour can be differentiated by means of these four motivational patterns. Because girls – in general – show higher levels of achievement motivation and of fear of failure, more research is needed in order to broaden our understanding of the effect of both tendencies (and their interaction) for girls and for boys on math and language achievement. Furthermore, the type of the tasks (i.e., math versus language) may also influence the levels of achievement motivation and fear of failure of boys and girls because of the possible gender differences in incentive values and subjective probabilities of success in language versus math achievement tasks. Also, an investigation of the effects of different goal orientations, such as, task orientated versus performance orientated on current achievement and
progress made, presents an interesting future line of research as they might be differentially related to the two outcome measures (i.e., current achievement and progress made). A possible hypothesis might be that task orientated goals are more strongly correlated with progress made than with current achievement whereas performance orientated goals are more strongly associated with current achievement. Unfortunately, such a hypothesis could not be tested in the present study because goal orientations were not measured during the LOSO-project.

In summary, we have found some evidence to argue that in explaining individual progress in achievement, one should not neglect the effect of achievement motivation, both of individuals and in groups, even when ability and background characteristics such as the socio-economic status, age, sex and home language are being considered as potential factors.

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Appendix A. Items contributing to the achievement motivation scale

3. I think of class as
   A. very pleasant
   B. not so pleasant
10. A school principal is often very busy and must work hard. To me such a job seems
    A. highly unattractive.
    B. attractive.
    C. very attractive.
11. Other people think that I
    A. study a lot.
    B. study not that much.
    C. study little.
12. I feel that time in school
    A. goes fast.
    B. goes rather slowly.
    C. goes very slowly.
18. When a test is at hand I study
    A. less than otherwise.
    B. as much as ever.
    C. more than normal.
20. Starting with my homework is
    A. something I like.
    B. something I find difficult.
21. For me, getting far in society is
    A. unimportant.
    B. important.
    C. very important.
22. The teachers think I am
    A. lazy.
    B. not very industrious.
    C. industrious.
25. I think of class as
    A. usually boring.
    B. seldom boring.
31. I become bored
    A. often.
    B. not that often.
    C. almost never.
40. When someone has got far in his occupation
    A. I admire that a lot.
    B. I have some admiration for it.
    C. It leaves me cold.
41. To carry on working a long time for school is
    A. easy for me.
    B. not that easy for me.
    C. very difficult for me.
47. When others disapprove of my behaviour
    A. I care little about it.
    B. I don’t mind it that much.
    C. It upsets me.
50. When school lasts longer than normal, I find that
    A. dreadful.
    B. not so bad.
51. When I study I demand
    A. much of myself.
    B. not much of myself.
    C. little of myself.
55. Gaining credit by having a good school report is something for which I
    A. don’t care much.
    B. sometimes do my best.
    C. always try hard.
59. I think that most of my classmates
    A. don’t study as hard as I do.
    B. study harder than I do.
60. To me, the idea of a life without work sounds
    A. very nice.
    B. rather nice.
    C. not nice.
67. When I worry about my report I
    A. try to think about something else.
    B. study as hard as usual.
    C. study harder than ever.
68. When I have been given an assignment to work out at home I
    A. sometimes make a mess of it.
    B. finish it as quickly as possible.
    C. do my best to get a good result.
69. Studying hard is something I
    A. like.
    B. don’t like.
    C. don’t like at all.
70. I think that making homework is
    A. very unpleasant.
    B. not so pleasant.
    C. rather pleasant.
71. When I am studying
    A. I often think about other things.
    B. I concentrate on it.
    C. I detest.
72. Going to school is something
    A. I like.
    B. I often dislike.
    C. I detest.
76. Paying attention at school is something
    A. I always do well.
    B. I often find very difficult.
The achievement motivation scale is based on 29 items from a larger questionnaire consisting of 87 items (which also aimed at measuring ‘fear of failure’). Some items have two and other items have three response alternatives. In order to build the achievement motivation score, the items are treated as dichotomous: a response contributes either a 1 (alternatives in italics) or a 0 (other responses) to the scale sum.