Performing with Motivation: The Longitudinal Relationship between Educational Motivation and School Performance

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Abstract

Students with poor grades and poor educational motivation are more likely to engage in criminal behavior, to be unemployed and have mental health problems. Relationships between educational motivation and school performance have been found, but there is a lack of studies that look at its bidirectional relationships. Therefore, this three-wave longitudinal study investigated (1) the bidirectional relationship between educational motivation (i.e., intrinsic and extrinsic motivation) and school performance, (2) the mediating role of independence, (3) and the moderating role of sex. The sample consisted of 759 students aged 11 to 15 and the participants filled in an online questionnaire. The findings showed a positive relationship was found between educational motivation and subsequent school performance. Independence did not mediate this relationship and sex did not moderate the relationship. There was no evidence for a reverse relationship and interesting differences were found between intrinsic and extrinsic motivation. In summary, this study indicates that, students with high educational motivation perform better at school, but students with good grades do not develop higher educational motivation. More research is needed on the found differences between intrinsic and extrinsic motivation and in future studies it is important to distinguish between these two types of motivation.

Keywords: educational motivation, school performance, independence, students

Samenvatting

Studenten met slechte schoolcijfers en weinig schoolmotivatie hebben meer kans om crimineel gedrag te vertonen, werkeloos te worden en psychische klachten te hebben. De relatie tussen schoolmotivatie en schoolprestaties is wetenschappelijk onderbouwd, maar er zijn geen studies die hebben gekeken naar de bidirectionele relatie tussen deze variabelen. Daarom wordt in deze studie met drie meetmomenten (1) de bidirectionele relatie tussen schoolmotivatie (zowel intrinsieke als extrinsieke motivatie) en schoolprestatie, (2) de mediërende rol van onafhankelijkheid, (3) en de modererende rol van geslacht onderzocht. De steekproef bestaat uit 759 scholieren met de leeftijd van 11 tot 15 jaar, de participanten hebben een online vragenlijst ingevuld. De resultaten lieten een positieve relatie zien tussen schoolmotivatie en daaropvolgend schoolprestatie. Onafhankelijkheid medieerde deze relatie niet en geslacht modereerde de gevonden relaties niet. Er is geen bewijs gevonden voor een bidirectionele relatie en interessante verschillen waren gevonden tussen intrinsieke en extrinsieke motivatie. Samengevat laat deze studie zien dat studenten met meer motivatie beter presteren op school, maar studenten met goede cijfers geen hogere schoolmotivatie ontwikkelen. Meer onderzoek is nodig over de gevonden verschillen tussen intrinsieke en extrinsieke motivatie en in vervolgonderzoeken is het van belang deze twee vormen van motivatie te onderscheiden.

Kernwoorden: schoolmotivatie, schoolprestatie, onafhankelijkheid, scholieren

Performing with Motivation: The Longitudinal Relationship between Educational Motivation and School Performance.

Adolescents who leave secondary school with poor educational motivation and poor grades are more likely to be unemployed and more at risk for criminal behavior, mental health problems, and physical health problems, such as chronic diseases and disability in later life (Avendano, Jürges, & Mackenbach, 2009; Fergusson, Swain-Campbell, & Horwood, 2002; Walkey, McClure, Meyer, & Weir, 2013). Therefore, it is important to find out what factors predict educational motivation and school performance in order to reduce social problems.

Educational motivation and school performance may actually predict each other. According to Linnenbrink and Pintrich (2002), motivation is defined as a strong personal interest in a particular subject. Motivated students learn and perform better and, therefore, achieve more in school. This implies that the school performance of motivated students is higher than the school performance of students who are not motivated. School performance represents school outcomes that indicate the extent to which a student has accomplished specific goals, such as grades (Steinmayr, Meißner, Weidinger, & Wirthwein, 2014). Although the relationship between educational motivation and school performance has been established (Linnenbrink & Pintrich, 2002; Wholuba, 2014), evidence about the bidirectionality is lacking.

Therefore, this study examines the bidirectional relationship between educational motivation and school performance among students from 11 to 15 years old. Adolescents were chosen to investigate because early adolescence has been identified as a precarious stage regarding changes in achievement beliefs and motivation (Ryan & Patrick, 2001). In addition, independence will be included as a moderator of the main relationship and sex will be examined as a moderator.

The Bidirectional Relationship between Educational Motivation and School Performance

The Self-Determination Theory (SDT) of Ryan and Deci (2000, 2008) could explain the effect of educational motivation on school performance. This theory posits that there are two versions of motivation: Intrinsic and extrinsic motivation (Van der Wulp, 2018). Intrinsic educational motivation refers to students who see the importance of making effort and they work hard because they understand that their future depends on it (Covington, 2000). Extrinsic motivation, on the other hand, is based on external influences like punishment and reward (Ryan & Deci, 1996; Vallerand, 2000; Van der Wulp, 2018).

Intrinsic motivation is seen as a more important predictor to optimize school performance because intrinsic motivated students are more autonomous and therefore it is easier to adjust to their schoolwork (Black & Deci, 2000; Deci, Vallerand, Perretier, & Ryan, 1991; Roeser, Eccles, & Sameroff, 2000). Extrinsic motivation, on the other hand, is less studied in relation to school performance. In a study of Vansteenkiste, Simons, Lens, Sheldon, and Deci (2004) intrinsic versus extrinsic motivation has been studied for the first time in relation to achievement. They found that intrinsic motivation resulted in better performance than extrinsic motivation. Cerasoli, Nicklin, and Ford (2014) found the same after a 40-year meta-analysis: Intrinsic motivation is a strong predictor of performance in school.

The reversed relationship between educational motivation and school performance is generally not mentioned and the theoretical background is limited. However, one explanation for the effect could be that the highest performing students feel a pressure to perform well in school and therefore are more likely to be motivated (Boaler, 1997; Stoeber & Rambow, 2006).

Overall, it is expected that educational motivation (i.e., intrinsic and extrinsic) has a positive effect on school performance, and school performance has a positive effect on educational motivation.

The Mediating Role of Independence

Independence in education is an attitude of the intellect that makes one willingly undertake different tasks or problems and realize or solve them in a responsible way (Okoń, 2005). Independence could mediate the relationship between educational motivation and school performance, because educational motivation leads to the use of metacognitive strategies like planning, making greater efforts, and less procrastination, which is in line with independent learning (Sierens & Vansteenkiste, 2009). Studies found that motivated students showed more independence than not motivated students (Roeser et al., 2000; Deci et al., 1991; Black & Deci, 2000; Wholuba 2014). A higher level of independence will help students to use more strategies in problem solving. Therefore, Pintrich (2002) and Schunk (2012) suggest that independent students are more likely to perform better in school. Based on these theories, it is assumable that independence is a mediating factor of the possible relationship between educational motivation and school performance.

The Moderating Role of Sex

It is important to know who are more susceptible for the relationship between educational motivation and subsequent school performance. Research of Spinath, Eckert, and Steinmayr (2014) showed that girls perform better in school due to aspects of a higher

motivation and because they are better adapted to today's school environments than boys. A majority of female teacher underlies this adaption, the surplus makes the content and transmission of education more feminine which leads to a better adaption (Driessen 2005; Driessen & Doesborgh, 2004). This phenomenon could influence the relationship between educational motivation and subsequent school performance, because girls are more sensitive to develop educational motivation. It is plausible that being a girl has a positive moderating effect on the relationship between one's educational motivation and school performance.

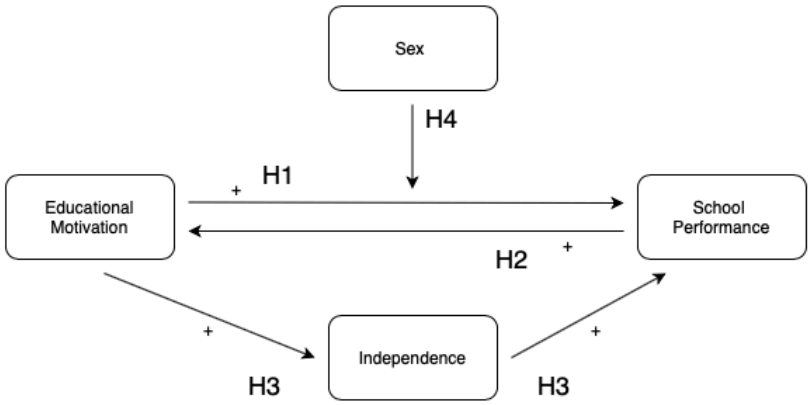
The Current Study

Due to a lack of studies that investigate the possible bidirectional relationship of educational motivation and school performance, this study will examine the following research question: To what extent is there a (bidirectional) relationship between educational motivation and school performance among students? The first hypothesis (H1) is that higher educational motivation (i.e., intrinsic and extrinsic) is related to higher subsequent school performance. The second hypothesis (H2) is that a higher school performance is related to more subsequent educational motivation (Figure 1).

In addition, the role of independence and sex are also investigated. Studies have examined independence and sex in relation to educational motivation and school performance separately (Black & Deci, 2000; Deci et al., 1991; Roeser et al., 2000; Spinath et al., 2014; Wholuba 2014), but there are no studies that examined the effects of these variables on the possible relationship between educational motivation and subsequent school performance. Therefore, this study will examine: (1) To what extent does independence mediate the relationship between educational motivation and subsequent school performance? and (2) To what extent does sex moderate the relationship between a student's educational motivation and subsequent school performance? The third hypothesis (H3) is that independence has a mediating effect on the relationship between educational motivation and subsequent school performance, that is, educational motivation is related to more subsequent independence, which in turn is related to a higher school performance. The fourth hypothesis (H4) is that the relationship between educational motivation and school performance is stronger for girls than for boys (Figure 1).

Figure 1.

Schematic Overview of the Hypotheses on the Relationship of Educational Motivation and School Performance.



Method

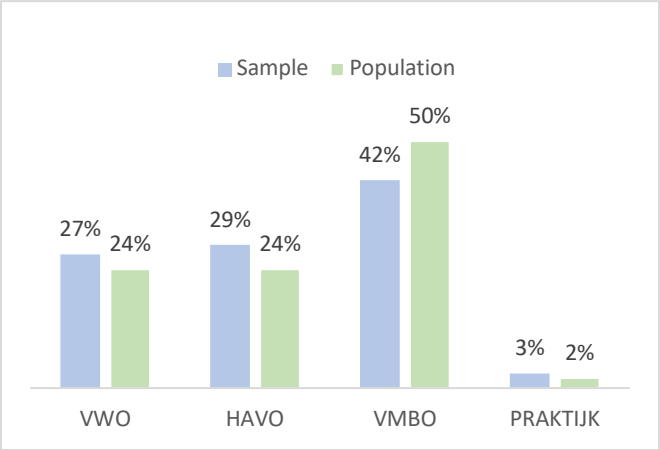
Design and Sample

In this study, data from the quantitative longitudinal Media Multitasking Study of the University of Amsterdam was used (Van der Schuur, Baumgartner, Sumter, & Valkenburg, 2019). This study was a three-wave longitudinal research in the Netherlands, with time-intervals of 3-4 months in the schoolyear 2014-2015, among 1215 students with the ages of 11-15 years old (M_{age} = 12.68, SD_{age} = 0.76, 52% boys).

After filtering out the missing data of motivation T1 and T3, independence T2, and grades T1 and T3, there were 761 respondents left. An attrition analysis was conducted to compare the students that had missing values on the used items (n = 454) and those who were included in analyses (n = 761). The dropout in wave two consisted of significantly more boys (t = -1.99, df = 1213, p < .05), and older students (t = .182, df = 519, p < .05). In the final sample 49% were boys, and the other 51% were girls. The mean age was 12.69 (SD_{age} = 0.82). As shown in Figure 2, the educational level of the used sample is similar to the level of all Dutch children, which makes the used sample representative when looking at educational level (CBS).

Figure 2.

Educational level Dutch population (CBS Statline) and educational level sample



Note. Population exists of all Dutch children aged 12 to 15 in the school year 2014/2015. Praktijk is the lowest level and vwo is the highest level.
VWO = vwo & havo/vwo, HAVO = havo & vmbo-t/havo, VMBO = vmbo-k / vmbo-t & vmbo-t, PRAKTIJK = vmbo-b & vmbo-b/vmbo-k

Procedure

Before the start of the Media Multitasking Study the researchers obtained ethical approval by the ethical committee of the University of Amsterdam. The schools were contacted via e-mail, seven of the schools agreed to participate in the study. Six schools also agreed on providing information about the obtained grades of the students, which will be used to measure the outcome variable of this study. The students and their parents received information about the study and were assured that participation was confidential and voluntary. Passive informed consent of the parents and informed consent of the students were obtained before the start of the study. The questionnaire was online and took approximately thirty minutes. The data collection took place under supervision of a researcher and/or the teacher (Van der Schuur, 2018; Van der Schuur et al., 2019). For the current study several items of the original data were selected by one of the researchers of the Media Multitasking Study. The irrelevant items for answering the research questions of this study were excluded from the data. Also, the researcher of the current study and the researcher of the Media Multitasking Study signed a data use contract.

Measuring Instruments

Educational motivation T1 and T3. Educational motivation at T1 and T3 was measured with eight items. This scale was based on the School Questionnaire for elementary

and secondary school (Smits & Vorst, 1990). Examples of the items are: (1) I often mess up my schoolwork; (2) I like to learn a lot in school; (3) I don't like working hard for school; (4) I think it is important to go to school. The items were rated on a 5-point scale (0 = *not at all true*, 1 = *not true*, 2 = *a little true*, 3 = *true,* and *4 = absolutely true)*. It was necessary to reverse the scores of the answers of the negative items, therefore four items were recoded to improve the reliability and guarantee a consistency in the measurement of the concept (Bryman, 2008).

The principal component analysis (PCA) was conducted to find out which motivation questions were about intrinsic or extrinsic motivation. The results showed two factors accounting for 58.33% of the variation in the measured variables, with eigenvalues larger than the Kaiser's criterion of one (i.e., 3.325 and 1.341). The first factor was based on extrinsic motivation and included four items (e.g., I work hard to get good grades), with factor loadings between 0.56 and 0.83. The second factor was more based on intrinsic motivation and included three items (e.g., For myself, I think it is important to go to school), with factor loadings between 0.64 and 0.82. One item loaded on both intrinsic and extrinsic motivation (I hate working hard for school), this item was excluded from the analyses.

Based on the PCA the mean score for both extrinsic (T1: $M = 2.82$, $SD = 0.73$, $\alpha = .86$; T3: $M = 2.58$, $SD = 0.82$, $\alpha = .60$) and intrinsic motivation (T1: $M = 2.62$, $SD = 0.74$, $\alpha = .85$; T3: $M = 2.45$, $SD = 0.79$, $\alpha = .75$) were calculated. The higher the mean of the motivation scale the higher one's (intrinsic or extrinsic) motivation.

School performance T1 and T3. School performance at T1 and T3 was measured by the actual academic achievement scores of students for the subjects Dutch, English, and math. These are the three mandatory subjects in secondary school which every student needs to pass (Onderwijsraad, 2008). The used grades were measurements of a student's academic achievement at the end of a school term. These scores are ranged from 1 to 10, according to the Dutch educational grading system. Higher grades indicate higher performance.

In this study the mean of all grades of T3 and T1 were used (T3: $M = 6.78$, $SD = 0.83$, $\alpha = .70$; T1: $M = 6.89$, $SD = 0.95$, $\alpha = .62$). These show that the mean grade of T3 is lower than the mean grade of T1, this implies that during the school year, school performance has decreased.

Independence T2. The mediator independence at T2 was measured with four items of the School Questionnaire for elementary and secondary school (Smits & Vorst, 1990). The items were about (1) whether one can work within his or her own pace; (2) if there is enough time and space to work on your own; (3) if one can choose what one is going to do and (4) if

the school tasks motivate to start working (Smits & Vorst, 1990). The PCA showed one component accounting for 54.60% of the variation in the measured variables, with an eigenvalue larger than the Kaiser's criterion of one (2.18). This implies that all items about independence measure the same (loadings between 0.32 and 0.34). Therefore, one scale was created with all four items about independence (M = 1.97, SD = 0.62, α = .73). These four items were measured a 5-point scale (0 = *not at all true*, 1 = *not true*, 2 = *a little true*, 3 = *true,* and *4 = absolutely true*). A higher score indicated more independence.

Sex. The possible moderator sex is measured with the next question: 'Are you a boy or a girl?' with the choice of two answers (0 = *boy*, 1 = *girl*).

Covariates. To find out if the possible relationship is really based on the variables mentioned above, educational level is used as a covariate, this was measured on the following scale (0 = *vmbo-b*, 1 = *vmbo-b/vmbo-k*, 2 = *vmbo-k/vmbo-t*, 3 = *vmbo-t,* and *4 = vmbo-t/havo,* 5 = *havo,* 6 = *havo/vwo,* 7 = *vwo*). This covariate will be used because division characterizes the Dutch educational system. After the elementary school, the choice is made for either vmbo, havo or vwo. Vmbo is the lowest level and vwo is the highest level (Scheerens, Luyten & Van Ravens, 2011). In addition, sex and age will also be used as covariates, because the ages of the students who filled in the questionnaire vary from 11 to 15 years old, and both boys and girls participated in the study.

Analyses

After detecting for outliers with a boxplot on the main variables several outliers were found for educational motivation. These cases showed possible answers and therefore were included in the analyses. Thereafter, multivariate outliers were examined with the Mahalanobis distance. In general, these were all acceptable, only a few cases had to be further examined.

Two cases had to be deleted because of repeated extreme answers and therefore were marked as untrustworthy. After filtering out the respondents, the sample existed of 759 respondents in total.

The assumptions were checked for linearity with a residual vs. fitted plot. All values were spread around the zero line, which indicates linearity. After looking at the standard residual vs. normal probability plot, almost perfect lines of 45 degrees were found. This means that the data was normally distributed. Homoscedasticity was not found in the dataset, which means there is a problematic appearance of heteroscedasticity in the possible bidirectional relationship between educational motivation and school performance and in the possible mediating effect of independence.

An alpha level of .05 was used for all statistical analyses. To examine the hypothesis of the relationship between educational motivation and school performance (H1), a linear regression analysis was applied, using the items on motivation of T1 and the grades of T3. To test whether this relationship is reversed as well (H2), the same regression analysis was applied using the items on grades of T1 and motivation of T3. To test if independence is mediating the effect between educational motivation and school performance (H3), the Baron and Kenny (1986) method was used. This means mediation was checked in several steps. Firstly, by running a bivariate regression predicting independence from educational motivation, and after that, running a multiple regression predicting school performance from independence and educational motivation. To examine if sex is moderating the effect of educational motivation and school performance (H4), a moderator analysis was used with multiple regression.

Results

Descriptive Statistics

Pearson correlations were examined and displayed in Table 1. This table shows that all correlation coefficients between educational motivation (i.e., intrinsic and extrinsic) and school performance were positive and significant in each wave. Students who reported a higher educational motivation had higher grades. The independence of the students in Wave 2 was also positively and significantly related to educational motivation and school performance. Students who were able to study more independently got higher grades and had better motivation.

When looking at the correlations of the covariates used in this study, it is shown that age, sex and educational level were not significantly correlated to independence. Age and sex were significantly correlated to educational motivation and school performance. Interestingly, educational level was not significantly correlated to educational motivation in the first wave, but it was significantly correlated to educational motivation in Wave 3. This indicates that at the beginning of the schoolyear a higher educational level does not lead to higher motivation, but at the end of the school year it does. Educational level is also significantly and positively correlated to the school performance. The higher one's educational level, the higher one's grades.

Table 1.
Correlation matrix of educational motivation T1 and T3, school performance T1 and T3, and independence T2.

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Motivation T1	-								
2. Intrinsic motivation T1	.835**	-							
3. Extrinsic motivation T1	.838**	.398**	-						
4. Motivation T3	.569**	.458**	.494**	-					
5. Intrinsic motivation T3	.455**	.473**	.289**	.836**	-				
6. Extrinsic motivation T3	.500**	.299**	.537**	.843**	.409**	-			
7. Grades T3	.271**	.186**	.257**	.231**	.181**	.206**	-		
8. Grades T1	.298**	.221**	.278**	.199**	.191**	.143**	.780**	-	
9. Independence T2	.303**	.260**	.246**	.354**	.303**	.291**	.170**	.149**	-
10. Age	-.126**	-.086	-.142**	-.093*	-.070	-.086*	-.101**	-.287**	-.029
11. Sex	.123**	.079*	.126**	.181**	.162**	.141**	.136**	.102**	.070
12. Educational level	.027	.049	-.003	.130**	.125**	.094**	-.081*	-.087*	.015

*Note: * $p < .05$; ** $p < .01$.*

Because sex is included as a moderator, sex differences for both educational motivation and school performance were examined. Educational motivation was higher for girls than for boys (T1: girls: $M = 2.79$, $SD = 0.59$; boys: $M = 2.64$, $SD = 0.62$; T3: girls: $M = 2.64$, $SD = 0.64$; boys: $M = 2.40$, $SD = 0.69$). This difference between boys and girls was significant in Wave 1 ($F = .157$, $t = -3.41$, $p = .001$) and Wave 3 ($F = .677$, $t = -5.06$, $p < .001$). In addition, girls had higher grades than boys in Wave 1 and Wave 3 (T1: girls: $M = 6.98$, $SD = 0.96$; boys: $M = 6.79$, $SD = 0.94$; T3: girls: $M = 6.89$, $SD = 0.81$; boys: $M = 6.66$, $SD = 0.84$). These differences were significant in both waves (T1: $F = .072$, $t = -2.82$, $p = .005$; T3: $F = .419$, $t = -3.79$, $p < .001$). The difference between boys and girls for independence in Wave 2 was small (T2: girls: $M = 2.02$, $SD = 0.65$; boys $M = 1.92$, $SD = 0.72$) and insignificant ($F = .769$, $t = -1.93$, $p = .054$).

The Relationship between Educational Motivation and School Performance

To find out whether a higher educational motivation (T1) was positively related to school performance (T3) (H1) a linear regression analysis was conducted. In this analysis educational motivation (T1) is the independent variable and school performance (T3) is the dependent variable. The relationship between educational motivation (T1) and school performance (T3), controlling for age, sex, educational level, and the school performance in Wave 1 was significant, $B = .064$, $p = .049$ (Table 2). The effect size of the relationship was small ($\beta = .046$). This relationship supports H1, students who reported higher levels of educational motivation at T1 had a higher school performance at T3.

Table 2.
Linear Regression Analysis between Educational Motivation (T1) and School Performance (T3) (N = 759)

	Coëfficiënts[a]				
Variables	*B*	*SE B*	*β*	*t*	*p*
(Constant)	-.142	.404		-.351	.726
Motivation T1	.064	.032	.046	1.975	.049
Age	.154	.026	.136	5.824	<.001
Sex	.082	.038	.049	2.192	.029
Educational level	-.014	.011	-.027	-1.215	.225
Grades T1	.699	.021	.797	32.839	<.001

Note: [a]*Dependent variable: Grades T3. F* = 255.74, $R^2 = .629$, *Adjusted* $R^2 = .627$.

The same regression analyses were conducted for intrinsic motivation and extrinsic motivation. Different relationships were found. The relationship between intrinsic motivation (T1) and school performance (T3), was insignificant, $B = .030$, $p = .264$, $\beta = .026$. The relationship between extrinsic motivation (T1) and school performance (T3) on the other hand, was significant, $B = .057$, $p = .034$. The effect size of the relationship between extrinsic motivation and school performance was small, $\beta = .050$. The results of the significant relationship between extrinsic motivation and school performance are shown in Table 3.

Table 3.
Linear Regression Analysis between Extrinsic Motivation (T1) and School Performance (T3) (N = 759)

	Coëfficiënts[a]				
Variables	*B*	*SE B*	*β*	*t*	*p*
(Constant)	-.152	.404		-.376	.707
Extrinsic Motivation T1	.057	.027	.050	2.126	.034
Age	.155	.026	.137	5.872	<.001
Sex	.081	.038	.049	2.156	.031
Educational level	-.013	.011	-.026	-1.155	.248
Grades T1	.700	.021	.798	33.140	<.001

Note: [a]*Dependent variable: Grades T3.* $F = 156.069$, $R^2 = .630$, *Adjusted* $R^2 = .627$.

The Relationship between School Performance and Educational Motivation

In addition, a regression analysis was conducted to examine if school performance (T1) is related to educational motivation (T3) (H2). In contrast to H2, the results showed that this relationship was small and not significant, $B = .020$, $\beta = .029$ $p > .05$ (Table 4).

Table 4.
Linear Regression Analysis between School Performance (T1) and Educational Motivation (T3) (N = 759).

	Coëfficiënts[a]				
Variables	*B*	*SE B*	*β*	*t*	*p*
(Constant)	.759	.429		1.768	.078
Grades T1	.020	.023	.029	.893	.372
Age	-.026	.028	-.028	-.919	.358
Sex	.143	.040	.106	3.589	<.001
Educational level	.047	.012	.116	3.943	<.001
Motivation T1	.613	.034	.548	17.783	<.001

Note: [a]*Dependent variable: Motivation T3. F* = 84.194, R^2 = .359, *Adjusted* R^2 = .351.

The same regression analyses were conducted separately for intrinsic and extrinsic motivation. The relationship between school performance (T1) and intrinsic motivation (T3) was significant, B = .072, p = .011, with a size effect of β = .086 (Table 5). The relationship between school performance (T1) and extrinsic motivation (T3) on the other hand, was insignificant, B = -.007, p = .798, β = -.008. These results show that students who get good grades at the beginning of the school year, will be intrinsically motivated at the end of the school year, but not extrinsically motivated.

Table 5.
Linear Regression Analysis between School Performance (T1) and Intrinsic Educational Motivation (T3) (N = 759).

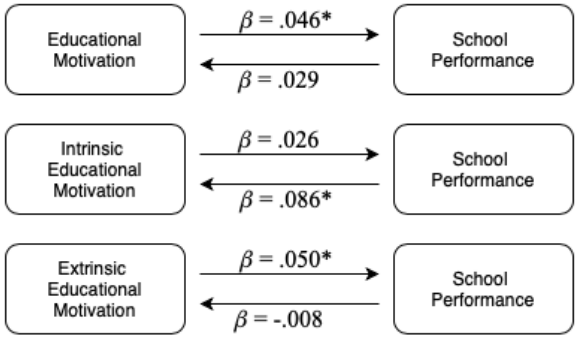
	Coëfficiënts[a]				
Variables	*B*	*SE B*	*β*	*t*	*p*
(Constant)	.745	.541		1.376	.169
Grades T1	.072	.028	.086	2.541	.011
Age	-.029	.036	-.027	-.825	.410
Sex	.180	.051	.113	3.572	<.001
Educational level	.051	.015	.107	3.366	.001
Intrinsic motivation T1	.485	.036	.440	13.614	<.001

Note: [a]*Dependent variable: Intrinsic motivation T3. F* = 52.473, R^2 = .258, *Adjusted* R^2 = .253.

An Overview of the Findings on the Bidirectional Relationship

In Figure 3 is shown which relationships are found to be significant when looking at the bidirectional relationship and which relationships do not exist in the relationship between motivation (i.e., intrinsic and extrinsic) and school performance.

Figure 3.
Schematic overview of relationships between motivation (intrinsic and extrinsic) and school performance.



*Note: * $p < .05$; ** $p < .01$.*

Mediating Role of Independence

The above results showed a relationship between educational motivation (T1) and school performance (T3). To see if independence is mediating this relationship (H3), the Baron and Kenny method was used. First, the relationship between educational motivation (T1) and independence (T2) was tested. A significant relationship was found with a moderate size effect, $B = .317$, $p = <.001$, $\beta = .277$, which means that students with higher motivation are more independent in school. This is in line with the hypothesis that one's educational motivation is positively related to the independence of a student. The results are shown in Table 6.

Table 6.
Linear Regression Analysis between Educational Motivation (T1) and Independence (T2) (N = 759).

	Coëfficiënts[a]				
Variables	*B*	*SE B*	*β*	*t*	*p*
(Constant)	.383	.522		.735	.463
Motivation T1	.317	.042	.277	7.580	<.001
Age	.024	.034	.026	.716	.474
Sex	.041	.049	.030	.855	.393
Educational level	.005	.014	.012	.346	.729
Grades T1	.054	.028	.074	1.963	.050

Note: [a]*Dependent variable: Independence T2. F* = 16.027, R^2 = .096, *Adjusted* R^2 = .090.

The results of the relationship between independence (T2) and school performance (T3) are shown in Table 7. An insignificant relationship was found, *B* = .051, *p* = .037, *β* = .042. This is not in line with the hypothesis that one's independence is mediating the relationship between educational motivation and school performance (H3).

Table 7.
Linear Regression Analysis between Independence (T2) and Grades (T3) (N = 759)

	Coëfficiënts[a]				
Variables	*B*	*SE B*	*β*	*t*	*p*
(Constant)	-.161	.403		-.399	.690
Motivation T1	.048	.034	.035	1.428	.154
Independence T2	.051	.028	.042	1.797	.073
Age	.152	.026	.134	5.783	<.001
Sex	.080	.037	.048	2.139	.033
Educational Level	-.014	.011	-.028	-1.239	.216
Grades T1	.696	.021	.794	32.676	<.001

Note: [a]*Dependent variable: Grades T3. F* = 214.283, R^2 = .631, *Adjusted* R^2 = .628.

Moderating Role of Sex

Regression analyses were conducted to find out if sex is moderating the relationship between educational motivation (T1) and school performance (T3). After the analysis a small positive effect was found, which was insignificant, *β* = .118, *p* = .484. This means that sex

does not moderate the relationship between educational motivation (T1) and school performance (T3). This is not in line with H4 that suggested this relationship would be stronger for girls than for boys. The results of the regression analysis are shown in Table 8.

Table 8.

Linear Regression Analysis between Motivation (T1) and Grades (T3) (N = 759)

	Coëfficiënts[a]				
Variables	*B*	*SE B*	*β*	*t*	*p*
(Constant)	6.937	.558		12.440	<.001
Motivation T1	.318	.069	.230	4.637	<.001
Sex by Motivation T1	.068	.097	.118	.700	.484
Age	-.073	.040	-.064	-1.832	.067
Sex	.003	.269	.002	.012	.990
Educational level	-.045	.017	-.090	-2.596	.010

Note: [a]*Dependent variable: Grades T3. F* = 16.577, R^2 = .099, *Adjusted* R^2 = .093.

Discussion

This longitudinal study among Dutch students investigated the possible bidirectional relationship between educational motivation and school performance and if this possible relationship could be mediated by independence and moderated by sex. Overall, the results indicated that there was no significant bidirectional relationship between educational motivation and school performance. The relationship between educational motivation (T1) and school performance (T3) was significant, but there was no support for the relationship between school performance (T1) and educational motivation (T3). After separating motivation into intrinsic and extrinsic motivation, bidirectionality was not found either. However, a significant relationship between extrinsic motivation (T1) and school performance (T3) was found and a significant relation between school performance (T1) and intrinsic motivation (T3) was found. Independence (T2) was not mediating and sex was not moderating the relationship between educational motivation (T1) and school performance (T3).

Bidirectional Relationship between Educational Motivation and School Performance

It was expected that educational motivation would be related to subsequent school performance (H1), and that school performance would be related to subsequent educational

motivation (H2). When examining educational motivation in general, it was found that students who reported more educational motivation showed higher school performance. These findings are in line with H1 that motivation is a predictor of school performance (Roeser et al., 2000; Deci et al., 1991; Black & Deci, 2000). The second hypothesis that higher school performance in the beginning of the schoolyear is related to higher motivation at the end of the schoolyear was not supported. This finding is not in line with the study of Boaler (1997) and the study of Stoeber and Rambow (2006). The different results of the current and previous studies could be explained by the time-intervals of the current study, because it is found that during a schoolyear one's educational motivation declines (Henderlong Corpus, McClintic-Gilbert, & Hayenga, 2009).

In addition to examining educational motivation in general, intrinsic motivation and extrinsic motivation were examined separately. Intrinsic motivation is not significantly related to school performance over time, but a significant relationship between school performance (T1) and intrinsic motivation (T3) was found. An explanation for this could be that the higher performing students feel an intrinsic desire to outperform their peers (McGeown, Norgate, & Warhurst, 2012).

Extrinsic motivation turned out to have a significant effect on one's school performance. The students who are motivated by external influences perform better at school. The young age of the students could be an explanation for this finding. As adolescents grow into adulthood there is an increasing need for autonomy and tendency to reject adult influence (Henderlong Corpus et al., 2009). The students in this study could be more vulnerable for extrinsic influences because of their young age. On the other hand, it was found that educational performance had no significant effect on extrinsic motivation.

The findings on both intrinsic and extrinsic motivation are conflicting with previous studies (Cerasoli et al., 2014, Vansteenkiste et al., 2004). They found that intrinsic motivation resulted in better performance than extrinsic motivation. The current study found the opposite: extrinsic motivated students perform better over time than intrinsic motivated students.

Mediating Role of Independence

The third hypothesis that independence has a positive mediating effect on the relationship between educational motivation and school performance was studied and could not be confirmed. The findings showed that educational motivation (T1) was positively related to a students' subsequent independence (T2), which is in line with the study of Sierens and Vansteenkiste (2009), but independence (T2) was not related to school performance (T3).

Studies (Black & Deci, 2000; Deci et al., 1991: Roeser et al., 2000) that showed motivated students gain more independence than students who are not motivated were supported by the findings of the current study. But studies (Pintrich, 2002; Schunk, 2012) that showed a relationship between independence and better school performance because of the capacities independent students have are not supported in the current study. The missing mediating effect could have to do with age. A study of Boller (2008) showed that children aged 11-13 are too young to be independent, so if students report to be independent it might possible that these independent characteristics are not developed enough in order to be related to performance.

Moderating Role of Sex

Findings showed that girls reported a higher motivation than boys, and girls had a higher school performance. These findings are in line with other studies on the school performance of boys and girls (Driessen & Doesborgh, 2004, Spinath et al., 2014). But the fourth hypothesis that being a girl has a positive moderating effect on the relationship between one's educational motivation and school performance was not supported in this study. An explanation for this could be that the research model should be different as motivation plays a strengthening role in explaining a relationship between sex differences and performance (Steinmayr & Spinath, 2008).

Strengths and Limitations

An important strength of this study is the longitudinal design, which consists of three measurements during a school year. This design improves the understanding of causal relationships over time (Bryman, 2008). This made it possible to examine both directions of the relationship between school performance and educational motivation. Another strength in this study is the similarity between the sample and the Dutch population of students in secondary school. Sex was equally divided, and the distribution of the school level was very similar to the actual distribution of school level in the Netherlands, which might improve the generalizability (Bryman, 2008).

Despite the above strengths, there were also limitations that should be taken into account. Firstly, the data from this study was gathered in 2014-2015. For future research it is important to use a more recent sample to improve the reliability. Secondly, the sample size of 759 students was not very high. Due to a lack of answers it was impossible to use the indented sample of 1215 students. Thirdly, self-reported questionnaires were used which may have led to inaccurate reporting, also called a social desirability bias (Demetriou, Ozer & Essau, 2014). Fourthly, the long time-intervals of 3-4 months could be of influence on the results because

the motivation of students change over a year (Henderlong Corpus, 2009). Fifthly, besides sex and independence there might be other variables of influence on the relationship between educational motivation and school performance, such as parenting style and school experience. The last limitation was the heteroscedasticity in the research model. This means that the standard error estimates can be biased, which leads to a possible bias in test statistics and confidence intervals (Allison, 1999).

Conclusions and Implications

This study showed that the bidirectional relationship between educational motivation and school performance does not exist. However, after separating motivation into intrinsic and extrinsic motivation, interesting results were found. The findings on educational motivation in general were very different from the findings on intrinsic and extrinsic motivation separately, which indicates an important difference exists between intrinsic and extrinsic motivation. These results bring two implications. First, more research is needed on the difference between intrinsic and extrinsic motivation. Secondly, in future studies it is important to distinguish between these two types of motivation.

Furthermore, it is important to gain more knowledge on what is mediating and/or moderating the effect between educational motivation and subsequent school performance. This study shows that girls in school are more motivated and perform better, and this study also shows that motivated students are more independent. But both findings do not have an influence on the relationship between educational motivation and subsequent school performance.

Studies (Avendano et al., 2009; Fergusson et al., 2002; Walkey et al., 2013) show that bad performance in school could lead to dangers in later life. Knowledge about the influencing mechanisms of the relationship between educational motivation and subsequent school performance is needed to get students in de right direction and restrain them from engaging in criminal behavior, becoming unemployed in later life or have mental health problems in later life.

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