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Factors that contribute to secondary school students' self-efficacy in being a successful university student

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ABSTRACT

Academic self-efficacy is a crucial predictor of first-year university study success, which makes it a key intended outcome of pre-university education. Students with high academic self-efficacy at the end of secondary education likely experience a better transition to university. This study aimed to investigate which factors relate to Dutch secondary school students' self-efficacy in terms of being a successful university student, including a personality variable (i.e. need for cognition), a motivational variable (academic interest), and behavioural variables (student engagement and out-of-school academic activities). Structural equation models served to test the proposed model. The results revealed that need for cognition, academic interest, and out-of-school academic activities related directly to self-efficacy; need for cognition and academic interest were especially pertinent. By focusing on improving students' need for cognition and academic interest, secondary school teachers can contribute to the development of students' academic self-efficacy and thereby increase their chances for a successful transition to university.

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University readiness; self-efficacy; need for cognition; academic interest

Introduction

In countries that are part of the Organisation for Economic Co-operation and Development, on average, one-third of all students entering higher education drop out before completion of their study programme (Organisation for Economic Co-operation and Development 2013). The first-year university drop-out rates in the Netherlands, where the present study was conducted, are similarly high: In 2012/13, 33% of university students did not continue on to the second year of the study programme they had started (Inspectie van het Onderwijs [Inspectorate of Education] 2016). The first-year experience of students is crucial for overall academic success in higher education: if a student is successful in the first year of

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higher education, he or she is more likely to graduate from university (Evans and Morrison 2011). Therefore, first-year study success in higher education is a well-researched topic. According to two influential, international reviews, in addition to previous achievement and standardised test scores, consistent non-cognitive predictors of achievement in university settings include self-efficacy, achievement motivation, grade goals, and effort regulation (Richardson, Abraham, and Bond 2012; Robbins et al. 2004). The primary predictors of retention were academic goals, academic-related skills, and self-efficacy (Robbins et al. 2004). Thus, self-efficacy functions as a crucial predictor of study success, impacting both achievement and retention. In their recent review, Honicke and Broadbent (2016) found a moderate correlation between self-efficacy and performance among university students.

Self-efficacy refers to a person's perception of his or her ability to perform adequately in a given situation (Bandura 1997). Academic self-efficacy in a university setting can be conceptualised as the student's belief that he or she can perform well in university-specific tasks, such as mastering the content of academic textbooks for a test and writing an essay to answer a research question. This construct is generalised (i.e. not related to any specific domain of study) and transferable over different programmes of study in the university (Gore 2006). Research on academic self-efficacy among first-year university students has shown that even though the average level of self-efficacy is above average in an absolute sense, there is substantial variance, including many students with low levels of self-efficacy (e.g. Chemers, Hu, and Garcia 2001). Institutes for higher education might seek ways to enhance their students' self-efficacy, but it also seems legitimate to ask how secondary education institutions can contribute to students' self-efficacy, even before they transition to university. In the Netherlands, the secondary school system is highly differentiated; the highest level, pre-university, aims to prepare students for university. In this sense, an important goal of pre-university education should be to contribute to students' self-efficacy, or their confidence about 'making it' at university, to help prepare them well for their university education.

In addition to being a predictor of achievement and retention, self-efficacy has been linked to characteristics that may help students cope effectively with challenges, such as the transition from secondary to university education. Students who are highly self-efficacious exert more effort and persevere in their learning, show higher levels of intrinsic motivation, are better at regulating their learning processes, undertake more challenging tasks, are more likely to adopt a mastery approach to learning, experience less stress in demanding situations, and adjust better in new learning situations (Bassi, Steca, and Delle Fave 2011; Bong 1997; Caraway et al. 2003; Chemers, Hu, and Garcia 2001; Geitz, Joosten-ten Brinke, and Kirschner 2016). The last two aspects in particular are extremely important in the transition from secondary education to university, which is stressful for many first-year students and during which the level of adjustment influences achievement (Germeijs and Verschueren 2007). Chemers, Hu, and Garcia (2001) found that self-efficacy in the first year in higher education relates strongly to adjustment,

even after controlling for secondary school grade point average (GPA). Thus, ‘confidence in one’s relevant abilities (i.e. self-efficacy) plays a major role in an individual’s successful negotiation of challenging life transitions’ (Chemers, Hu, and Garcia 2001, 55), and academic self-efficacy represents a crucial determinant of a successful transition from secondary school to university. Accordingly, students’ self-efficacy should already be high even before they start their university studies, rather than waiting for first-year programmes to take measures to raise students’ self-efficacy after they have started.

Therefore, we sought insights into which personality, motivational, and behavioural variables might influence secondary school students’ self-efficacy regarding being a successful student in university. The personality variable we tested was need for cognition (NFC); the motivational variable was academic interest; and the two behavioural variables were out-of-school academic activities and behavioural engagement – all variables that likely relate to self-efficacy (e.g. Chen et al. 2016; Elias and Loomis 2002; Marks 2000). These variables are also generally amenable to change, so secondary school teachers arguably could address them (Hidi and Renninger 2006; Linnenbrink and Pintrich 2003). To the best of our knowledge, no previous research has investigated secondary school students’ self-efficacy with regard to being a successful university student.

Need for cognition

Need for cognition is ‘an individual’s tendency to engage in and enjoy effortful cognitive endeavours’ (Cacioppo et al. 1996, 197). Cacioppo et al. (1996) categorise it as a personality variable. An important difference between individuals high in NFC and those low in NFC is that the former are more likely to try to make sense of (difficult) information themselves, actively acquire information, and think about and reflect on things, whereas the latter rely on others or external cues to provide information and the structure to make sense of it. Notably, a key difference between the secondary school learning environment and the university learning environment is the level of structure provided. At university, students are expected to be independent learners who manage their own learning process and tackle difficult information by themselves. High NFC students thus may be more confident in their ability to study independently and have more confidence in their success at university. As Elias and Loomis (2002) have shown, NFC increases students’ academic self-efficacy beliefs. Therefore, in our model we used NFC as a personality factor that affects academic self-efficacy directly, as well as indirectly through out-of-school academic activities, academic interest, and engagement – variables we describe subsequently.

Academic interest

Hidi and Renninger (2006, 112) suggested that interest is a motivational variable which ‘refers to the psychological state of engaging or the predisposition to

reengage with particular classes of objects, events, or ideas over time'; Schunk, Pintrich, and Meece (2008, 210) defined interest as 'people's liking and willful engagement in an activity'. These definitions stem from person-object theory, which states that interest emerges from a person's interaction with the environment or an object, which is not necessarily tangible and thus can refer to a topic, idea, activity, or subject matter (Hidi and Renninger 2006). Research has revealed a relationship between interest and self-efficacy, although there is some disagreement about the direction of this relationship: does self-efficacy precede interest, or is the relationship reciprocal? Some evidence implies that interest influences self-efficacy (Chen et al. 2016), which Hidi (2006) explained by noting that self-efficacy grows through the pursuit of interest-driven activities which invoke positive affect.

Interest often appears as a subject-specific construct (i.e. interest in history or mathematics), but it can also be defined more generally, encompassing collections of related subjects and topics (cf. 'general interest in school'; Wentzel 1998). We adopted this generalised, persistent view to focus on individual interest (i.e. liking, engaging with, and being predisposed to re-engage) in gaining academic knowledge in a chosen field and its research-based activities. For expediency, we refer to this construct as 'academic interest'. This broad version of academic interest is especially appropriate for pre-university education, which involves students with high ability levels who aim to be the future generations of scholars. We expected academic interest to function similarly to interest in a specific subject or topic: greater interest leads to more self-efficacy.

Behavioural engagement

Behavioural engagement is part of the broader construct of student engagement, which refers to involvement in and commitment to school (Landis and Reschly 2013). Behavioural engagement comprises indicators such as attendance, participation, and preparation (Christenson, Stout, and Pohl 2012; Fredricks, Blumenfeld, and Paris 2004). Linnenbrink and Pintrich (2003) found a consistent, stable relationship between self-efficacy and behavioural engagement, implying a directional link from self-efficacy to engagement, although they also cautioned that the relationship might be reciprocal: 'The more a student is engaged, and especially the more they learn and the better they perform, the higher their self-efficacy' (Linnenbrink and Pintrich 2003, 123). Therefore, we proposed that behavioural engagement influences academic self-efficacy.

Out-of-school academic activities

Behavioural engagement focuses specifically on school-related activities (e.g. homework, studying for tests). Need for cognition is a personality construct which implies that students are curious, but it may not necessarily lead to students acting

on that curiosity. Students who intend to go to university not only require NFC but also must act on this NFC by performing self-initiated academic activities outside school. Such informal out-of-school academic activities might include reading the research section on a popular news website, talking to friends or family about academic knowledge, or watching enquiry-based documentaries. Secondary school students who perform such out-of-school academic activities likely become more acquainted with the world of academia and the enquiry-based way of thinking and therefore may be more self-efficacious regarding their university studies. Little research has addressed this type of activity specifically, so we included this variable as an exploratory construct and investigated whether it would affect students' academic self-efficacy.

Background variables

We included three background variables in this study: gender, parental educational level, and type of coursework. The rationales for including them were either that prior research has linked them to the measured constructs or because little research has addressed the relationship between a specific background factor and a measured construct, and we sought to examine this relationship.

Gender

No consistent gender differences in self-efficacy have appeared in previous research (Choi 2005; Hampton and Mason 2003), but gender seems to influence one of the intermediate variables that lead to academic self-efficacy; research has consistently shown that girls are more engaged in school than boys (Lam et al. 2012; Marks 2000). Regarding NFC, Cacioppo et al.'s (1996) review of individual differences indicated no gender differences in total scores on the Need for Cognition Scale. Regarding out-of-school academic activities, we found no research on the extent to which girls and boys are involved in informal learning. Thus, we had no specific expectations regarding gender differences in academic interest.

Parental educational level

Parents' cultural capital influences their children's academic achievement (Jæger 2011). Parents with higher educational levels create more stimulating home environments and interact more with their children around learning activities (De Graaf, De Graaf, and Kraaykamp 2000; Eccles 2005). According to the parent socialisation model, these influences enhance children's engagement in educational activities, as demonstrated empirically by Davis-Kean (2005). Therefore, parental educational levels could be related to both engagement and academic out-of-school activities. Moreover, in line with Bourdieu's cultural and social capital theory, parents who have attended university themselves should be more familiar with university-level learning and thinking and foster similar kinds of learning

and thinking in their children (Devlin 2013). Hence, the parents' educational level could influence students' NFC and academic interest.

Humanities/social sciences versus science coursework

Little research has described the potential influence of a student's coursework – such as whether it is focused mainly on humanities and social sciences or on science subjects – on the variables in our model. Students in Dutch secondary education must choose between subjects that focus on humanities and social sciences or on natural sciences, which provided us with an opportunity to explore whether these students would differ in their NFC, out-of-school academic activities, academic interest, engagement, or self-efficacy.

Aims and research question

Figure 1 depicts our proposed model, with all of the constructs and variables that we expected to relate to self-efficacy in university studies. We do not offer specific hypotheses regarding the background variables, because past research has not provided conclusive guidelines regarding whether to expect certain pathways. Consequently, we investigated the roles played by background variables in an exploratory fashion.

As our main research question, we asked: what is the relative importance of NFC, academic interest, behavioural engagement, and out-of-school academic

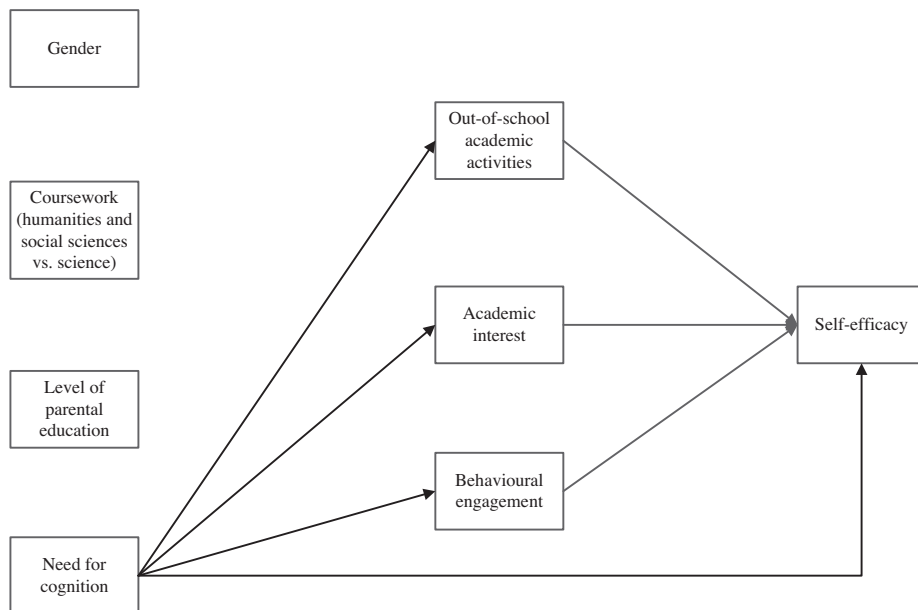


Figure 1. Theoretical model: factors influencing self-efficacy.

Note: There are no pathways hypothesised from the background variables. Based on exploratory analyses, pathways from these variables will be added and tested.

activities in terms of influencing students' self-efficacy for being a successful university student? How much influence is exerted by background variables, including gender, level of parental education, and taking science or humanities/social sciences coursework in secondary school?

Method

Context

We conducted this study in the Netherlands, where the secondary education system is relatively differentiated. After eight years of primary education, students enter a specific secondary education channel according to their abilities, tested at the end of their primary education. The highest level of secondary education is pre-university education, attended by approximately 17% of Dutch adolescents (CBS [Statistics Netherlands] 2012). Graduating from pre-university grants students direct entrance into university education. About 80% of pre-university students enter university after graduation (CBS [Statistics Netherlands] 2016). The other levels of secondary education are general secondary education and vocational secondary education, graduating from which grants students access to a professional higher education or vocational education, respectively. Depending on the field of study, there are alternative pathways to university, such as graduating from professional higher education. Because pre-university grants direct access to the university track, however, next to preparing students for their final examinations, university preparation is the central goal for this education stream. In Grades 10–12, Dutch pre-university education students undertake either science coursework (e.g. biology, chemistry, physics, advanced mathematics) or humanities and social sciences coursework (e.g. history, geography, modern languages, economics), in addition to subjects that are obligatory for all students (e.g. Dutch, English). The variance in pre-university students' cognitive capacities is relatively low, which is why we focus on personality, motivational, and behavioural aspects.

We collected data from Grade 10 and 11 students at the end of the school year, so most of the students would be attending university in two or one years, respectively, from the moment of data collection. All of these students had started with the mandatory career orientation programme, so they should be able to make a reasonable estimate of their self-efficacy regarding university skills and their academic interest, including their feelings about gaining academic knowledge and their interest in research. The survey clearly described the required university study skills, which are similar to pre-university study skills, involving general skills such as planning, organising, text reading, and essay writing. Therefore, the student participants should be able to estimate their efficacy in university-level study skills.

Sample

Eight secondary schools in different geographical regions in the Netherlands were contacted to determine their interest in participating in our research on self-efficacy related to university preparation. Five schools were willing to do so. From these schools, 759 pre-university students in Grades 10 and 11 completed two questionnaires that measured the variables of interest, after we had obtained parental consent (22 students were ill at the time of data gathering, and three students did not have parental consent to participate). The sample was balanced in gender (50.5% girls) and grades (51.9% Grade 10). A small majority of students (54.9%) did science coursework; the other students took humanities/social sciences coursework. Of all Dutch pre-university students, 53% are female and 60% undertake science coursework (Platform Bèta Techniek [Science Foundation] 2014), so our sample reasonably resembles the population. The ages of the participants ranged from 13 years and 6 months to 20 years and 2 months, with an average age of 16 years and 9 months. We also asked students whether one or both of their parents had attended university; most of them indicated that neither parent had attended university (65.4%), 21.3% of students noted that one parent was educated at a university level, and 13.3% had two university-educated parents.

Measures

Need for cognition was measured with the efficient version of the Need for Cognition Scale by Cacioppo, Petty, and Kao (1984), using an 18-item 5-point Likert questionnaire. Sample items included 'I would prefer simple to complex problems' and 'Thinking is not my idea of fun' (reverse-coded). This questionnaire was translated into Dutch, using a back-translation procedure. Previous research affirmed that this scale consists of one factor and has good internal consistency (Sadowski 1993). Similarly, we found $\alpha = 0.83$.

Academic interest was defined as a desire to gain academic knowledge in one's field of interest and to conduct research-based activities because the person finds it inherently interesting or enjoyable. The items were based on the Scientific Attitude Inventory II (Moore and Foy 1997). Academic interest was measured with six items, after removing redundant items, identified in a pilot test. Sample items were 'I like the idea of gaining academic knowledge in the field of my interest' and 'I hope to one day get a job that includes doing research'. To ensure the items were not skewed in the favour of people who were interested in pursuing a science career, as opposed to students with humanities or social sciences interests, we avoided mentioning specific disciplines and emphasised that this section of questions focused on general academic interest, regardless of the field. Students had to answer on a four-point Likert-scale (1 = 'completely disagree'; 4 = 'completely agree'). The academic interest scale was highly internally consistent ($\alpha = 0.87$).

In line with prior literature, we developed a questionnaire with three components of student engagement: behavioural, cognitive, and emotional. These three components were measured with self-reported questions on a five-point Likert scale (1 = 'does not describe me at all'; 5 = 'describes me very well'). We took the items from existing instruments that measured components of student engagement, such as the Student Engagement Instrument (Appleton et al. 2006), the Student Engagement in Schools Questionnaire (Hart, Stewart, and Jimerson 2011), Engagement versus Disaffection with Learning (Skinner et al. 2008), and the Identification With School Questionnaire (Voelkl 1996). To develop our measure of student engagement, we proceeded through three steps. First, we chose items that appeared in multiple existing instruments and that clearly related to behavioural, cognitive, and emotional engagement, and then translated them into Dutch with a back-translation procedure, resulting in an initial version of the instrument. Second, we tested this initial version with a small number of students in upper-grade, pre-university classes. Third, we conducted analyses to eliminate any redundant items and establish the psychometric qualities of the instrument. The final version of the instrument consisted of 19 items: eight measuring behavioural engagement (e.g. 'I actively participate in class', $\alpha = 0.87$), five measuring emotional engagement (e.g. 'I enjoy most classes in school', $\alpha = 0.70$), and six measuring cognitive engagement (e.g. 'In school you learn important things', $\alpha = 0.76$). In this study, we only used behavioural engagement.

To measure out-of-school academic activities, we used six items, each consisting of an academic-related activity that can be performed at home, such as 'Watching television programmes with an academic touch, e.g. documentaries on Discovery Channel or documentaries on psychological topics' or 'Reading research news items in the paper or on news websites.' Similar to the measure of academic interest, we put effort into ensuring that these items were not skewed in favour of the people with science interests. For example, we included examples of both science and non-science academic activities in the items, as the sample items indicate. Students noted how often they performed each of these activities, on a scale from one ('never') to five ('daily'). Pilot testing showed that these items did not need any adaptation. Out-of-school academic activities had sufficient internal consistency ($\alpha = 0.77$).

Following Bandura's (1997) definition of self-efficacy, we conceptualised academic self-efficacy as the belief a student has in his or her capabilities to organise and execute the courses of action that are required to be a successful university student. The items that we used therefore reflect typical academic skills which students need for their university studies, such as being capable of independent study, understanding difficult subject matter, and being able to write essays (Jansen and Suhre 2010; Krause 2001; Lowe and Cook 2003). Because the participants were still in secondary education, we clearly described the required academic skills and started the question block of academic self-efficacy with an explanation of what studying at university is like. For example, we explained the difference

between lectures and seminars, to give the participants the necessary context to answer questions that focused specifically on these settings. After pilot testing and subsequently removing redundant items, 6 of the original 15 items remained. Students rated their confidence that they would be able to perform these skills successfully on a four-point Likert-scale (1 = 'not confident at all'; 4 = 'very confident'). Examples included 'Studying three academic books thoroughly for a test' and 'Writing an essay on an academic subject in your own field of interest, based on research evidence'. This factor achieved an internal consistency of $\alpha = 0.70$. All of the measures are summarised in Table 1.

Procedure

The questionnaires were all paper-and-pencil tests, handed to the students during class by the researchers or a teacher who had received instruction. Informed consent from parents was obtained in advance. Students who did not have parental consent to participate (three students out of the whole sample) went to an empty classroom or another place in the school where they did some homework. Participation by students was voluntary and without compensation but strongly encouraged by teachers. None of the students who got consent from his or her parents refused to participate.

Statistical analyses

We sought to determine how well our theoretical model (Figure 1) fit the data provided by a sample of Dutch, Grade 10 and 11, pre-university students. To avoid including unnecessary pathways from the background variables in the model, we first conducted *t* tests and an analysis of variance (ANOVA) to test for significant differences in NFC, out-of-school academic activities, engagement, academic interest, and self-efficacy, based on gender, coursework, and level of parental education. We also looked at the bivariate correlations across all included factors. After conducting these exploratory analyses, we undertook structural equation modelling (SEM) with the statistical package available in Mplus, Version 7. Regarding the background variables, we only included pathways if we found a significant difference in the *t* test or ANOVA. For example, if we found a significant

Table 1. Means, standard deviations (SDs), number of items, Cronbach's alpha, and minimum and maximum values.

Variable	Mean	SD	Range		<i>n</i> items	α
			Potential	Actual		
Need for cognition	3.42	0.48	1–5	1.67–4.89	18	0.83
Academic interest	2.89	0.68	1–4	1.00–4.00	6	0.87
Behavioural engagement	3.60	0.78	1–5	1.00–5.00	8	0.87
Out-of-school academic activities	2.26	0.73	1–5	1.00–4.57	6	0.77
Self-efficacy	2.58	0.48	1–4	1.00–4.00	6	0.70

difference between boys and girls regarding their NFC, we added a pathway from gender to NFC. To evaluate the goodness of fit of the models, we considered the ratio of the chi-square to its degrees of freedom (χ^2/df), root mean square error of approximation (RMSEA), standardised root mean square residual (SRMR), comparative fit index (CFI), and Tucker–Lewis index (TLI), which is less susceptible to sample size (Tucker and Lewis 1973). With our relatively large sample size ($n > 400$), the p value of the sample size-sensitive chi-square test could be erroneously significant and thus may not adequately reflect whether our model provides a good fit to the data (Schumacker and Lomax 2004). Following established guidelines, we determined that the model offered an appropriate reflection of the data if the χ^2/df value was less than 3 (Kline 2005), the RMSEA was less than 0.07, the SRMR was less than 0.08, and the CFI and TLI were greater than 0.90 (Chen et al. 2008; Hu and Bentler 1999; Kline 2005; Steiger 2007; Tucker and Lewis 1973).

Results

Preliminary analyses

Table 1 presents the descriptive statistics for NFC, academic interest, behavioural engagement, out-of-school academic activities, and self-efficacy in being a successful university student. Table 2 presents the bivariate correlations among the factors. Tables 3, 4, and 5 also present the gender, coursework, and parental education differences, respectively. Substantial gender differences emerged regarding the behavioural variables: girls were significantly more behaviourally engaged than boys, but boys engaged more in out-of-school academic activities. Small but significant gender differences were found for NFC and academic interest, such that boys scored higher on these variables. Boys and girls did not differ in their level of self-efficacy. Regarding coursework, we found a large difference in academic interest and a smaller difference in NFC, both in favour of students taking science coursework. Students with two university-educated parents were also substantially higher in NFC, engaged in more out-of-school academic activities, and were higher in self-efficacy than students whose parents had not attended university. These significant differences were entered as control variables in the path model.

Table 2. Bivariate correlations between the factors.

	1	2	3	4	5
1. Need for cognition	–	0.50**	0.18**	0.37**	0.43**
2. Academic interest		–	0.13**	0.35**	0.42**
3. Behavioural engagement			–	–0.08	0.04
4. Out-of-school academic activities				–	0.32**
5. Self-efficacy					–

* $p < 0.05$.

** $p < 0.01$.

Table 3. Gender differences.

Variable	Mean (SD) girls	Mean (SD) boys	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
Need for cognition	3.37 (0.48)	3.47 (0.48)	-2.14	0.03	0.19
Academic interest	2.82 (0.71)	2.95 (0.64)	-2.03	0.04	0.19
Behavioural engagement	3.90 (0.67)	3.30 (0.77)	8.81	<0.01	-0.81
Out-of-school academic activities	2.05 (0.69)	2.46 (0.71)	-6.32	<0.01	0.59
Self-efficacy	2.56 (0.49)	2.61 (0.48)	-1.07	0.29	0.18

Note: SD = standard deviation.

Table 4. Coursework differences.

Variable	Mean (SD) hum & soc	Mean (SD) science	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
Need for cognition	3.34 (0.49)	3.48 (0.46)	-3.09	<0.01	0.30
Academic interest	2.67 (0.71)	3.06 (0.61)	-6.42	<0.01	0.59
Behavioural engagement	3.62 (0.78)	3.60 (0.77)	0.22	0.82	-0.03
Out-of-school academic activities	2.19 (0.73)	2.31 (0.73)	-1.79	0.07	0.16
Self-efficacy	2.60 (0.48)	2.56 (0.49)	0.85	0.40	-0.08

Notes: SD = standard deviation; hum & soc = students taking humanities and social sciences coursework; science = students taking science coursework.

Table 5. Parental education differences.

Variable	Mean (SD) 0	Mean (SD) 1	Mean (SD) 2	<i>F</i>	<i>p</i>	Cohen's <i>d</i>
Need for cognition	3.36 (0.50)	3.47 (0.44)	3.57 (0.44)	5.60	<0.01	0.45
Academic interest	2.85 (0.70)	2.87 (0.74)	2.98 (0.58)	0.94	0.39	0.20
Behavioural engagement	3.58 (0.78)	3.64 (0.77)	3.66 (0.76)	0.37	0.69	0.10
Out-of-school academic activities	2.17 (0.70)	2.29 (0.75)	2.51 (0.77)	6.50	<0.01	0.46
Self-efficacy	2.53 (0.47)	2.66 (0.50)	2.66 (0.50)	4.11	0.02	0.27

Notes: SD = standard deviation; 0 = students whose parents had not attended university; 1 = students for whom one of the parents attended university; 2 = students for whom both parents attended university. Cohen's *d* is the standardised difference between the score of students with zero university-educated parents and students with two university-educated parents.

Path analysis

We first tested our conceptual model, as presented in Figure 1, with the effects of the background variables we found in the *t* test or ANOVA. This model achieved a good fit: $\chi^2_9 = 17.33$, $p = 0.04$ ($N = 472$); $\chi^2/df = 1.93$; RMSEA = 0.04 (90% confidence interval [0.01, 0.08]), SRMR = 0.02, CFI = 0.98, and TLI = 0.95. However, two of the proposed pathways from gender were insignificant: to NFC and to academic interest. Moreover, the pathway from parental education to academic self-efficacy was insignificant, as was the pathway from behavioural engagement to academic self-efficacy. Therefore, we tested a second model, with the insignificant pathways removed. Figure 2 depicts the path coefficients for the proposed relationships in this model. The goodness-of-fit statistics confirmed that this model fit the data very well: $\chi^2_{12} = 22.12$, $p = 0.04$ ($N = 472$); $\chi^2/df = 1.84$; RMSEA = 0.04 (90% confidence interval [0.01, 0.07]), SRMR = 0.04, CFI = 0.98, and TLI = 0.96.

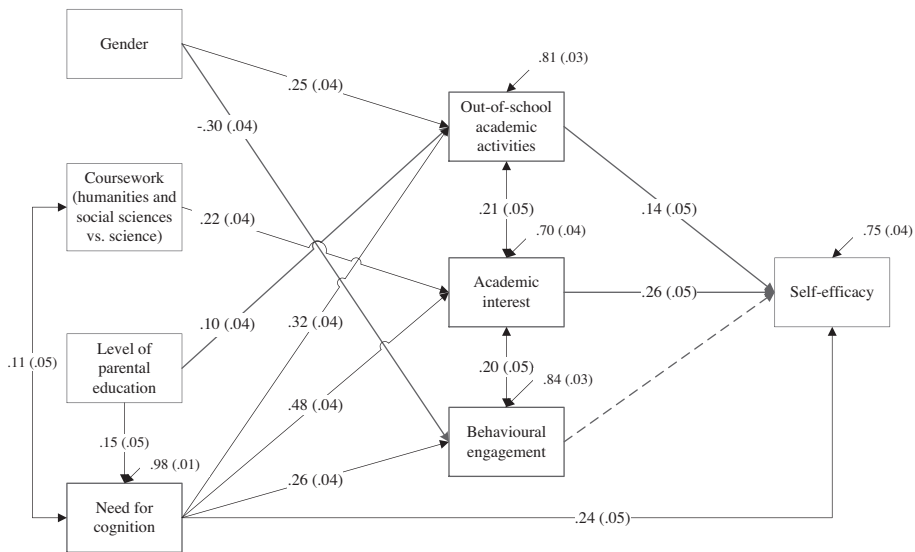


Figure 2. Standardised effects (and standard errors) of all factors in the model influencing self-efficacy.

Note: $\chi^2_{12} = 22.12, p = 0.04$ ($N = 472$); $\chi^2/df = 1.84$; RMSEA = 0.04 (90% confidence interval [0.01, 0.07]), SRMR = 0.04, CFI = 0.98, and TLI = 0.96. Gender was coded as 0 = female; 1 = male. Parental educational level was coded as 0 = no parent attended university; 1 = one parent attended university; 2 = two parents attended university. Coursework was coded as 0 = humanities/social sciences student; 1 = science student. A dotted line represents a non-significant pathway.

Need for cognition, out-of-school academic activities, and academic interest related to students' academic self-efficacy. Of these variables, NFC and academic interest had the greatest impacts ($\beta = 0.24$ [0.05] and $\beta = 0.26$ [0.05], respectively), whereas out-of-school academic activities mattered less ($\beta = 0.14$ [0.05]). Contrary to expectations, behavioural engagement was not related to academic self-efficacy: Students who were more behaviourally engaged in school did not necessarily have more confidence in their abilities to be a successful university student. We confirmed the hypothesised link from gender to behavioural engagement, such that girls were more engaged in school. The level of education of the parents also significantly influenced NFC and the extent of out-of-school academic activities in which a student engaged. The level of education of the parents, however, did not influence a student's behavioural engagement or academic interest. Other links arose between gender and out-of-school academic activities ($\beta = 0.25$ [0.04]), between coursework and NFC ($\beta = 0.11$ [0.05]), and between coursework and academic interest ($\beta = 0.22$ [0.04]). Thus, boys were more engaged in out-of-school academic activities and students undertaking science coursework had a higher NFC and showed more academic interest.

Discussion

Academic self-efficacy is an important predictor of study success in university (Robbins et al. 2004), and it has the potential to help students experience a smooth

transition from secondary education to university, in that highly self-efficacious people cope better with difficult situations (Bandura 1997). By expanding understanding of variables that relate to secondary students' self-efficacy in studying at university, our findings provide relevant insights for Dutch education, as well as for educators in other countries that have an educational track which prepares students specifically for university, such as Germany (*Gymnasium*) and Italy (*liceo*). In comprehensive school systems, these results also have value, because they suggest a means for identifying the brightest students, who have the attitudes and corresponding behaviours needed to pursue a university education.

Being self-efficacious provides an important foundation for university success, so it is useful to determine which variables relate to this intended outcome of pre-university education. In this study, we have sought to identify which personality, motivational, behavioural, and background variables relate to secondary school students' self-efficacy with regard to being a successful student in university, so that secondary school educators know where to focus as they work to prepare their students for the transition to university. We found that NFC, out-of-school academic activities, and academic interest all affect academic self-efficacy. Background variables also played a role, such that boys performed more out-of-school academic activities than girls, students with science coursework had a higher NFC and more academic interest than students with mainly social sciences and humanities coursework, and students whose parents have attended university had a higher NFC and performed more out-of-school academic activities. In addition, the results revealed a powerful role of the personality construct NFC, which affects self-efficacy directly but also indirectly, by influencing out-of-school academic activities and academic interest. Our findings are in line with previous research that cites a connection between NFC and self-efficacy (Elias and Loomis 2002) and between interest and self-efficacy (Chen et al. 2016).

Out-of-school academic activities also contributed to self-efficacy, likely because students who perform self-initiated, informal academic activities at home become more familiar with the world of academia and therefore feel more confident that they can thrive in a university environment. Engagement did not significantly influence self-efficacy. The absence of this link was surprising; much research points to the importance of engagement for academic outcomes. By actively engaging in learning activities, students develop knowledge and skills, which enhances their self-efficacy beliefs (Klem and Connell 2004; Marks 2000). We also did not find gender differences in self-efficacy, so the absence of a link between engagement and self-efficacy cannot be explained by girls' higher engagement scores.

In this study, students undertaking science coursework exhibited more academic interest than students taking humanities/social sciences subjects, which might be because science classes in secondary school have greater potential to arouse academic interest (i.e. wanting to do research and pursuing knowledge) than humanities and social science classes. In biology, physics, and chemistry courses, teachers often use enquiry-based methods, engaging and student-centred

instruction, and data analyses of actual research questions, reflecting ‘real’ academic enquiry (Anderson 2002; Schroeder et al. 2007). Science students thus become more familiar with conducting research; humanities and social science students might feel left behind or less familiar with the academic opportunities in their field of interest. An alternative (or complementary) explanation may involve self-selection: students who choose to take on science coursework may, at that moment of choosing (in Grade 9), already have more academic interest and therefore choose science subjects because they believe they better match their interests in doing research and gaining academic knowledge. A related point pertains to a widespread stereotype among Dutch students (and parents and teachers) that science subjects are more prestigious, so students choose humanities/social sciences coursework only if they have low grades or are less ambitious (Groot 2016).

We expected that the level of parental education would influence all variables, but we only found evidence that university-educated parents passed on a NFC and a habit of being involved in academic activities outside school hours to their children. These influences by parental education were rather small. The connections of parental educational level with NFC and out-of-school academic activities might have arisen because parents with less education lack the means to foster their children’s curiosity and learning (Spera 2005).

Finally, we found an interesting connection between gender and out-of-school academic activities. Boys, although less engaged in school, were more engaged in out-of-school academic-related activities, such as looking up news on academic topics on the Internet or reading or watching research-based documentaries. The Internet is becoming a primary medium for informal learning; research also shows that boys spend more time than girls looking up information on the Internet (Vekiri and Chronaki 2008). Another explanation could be that boys feel less at home in the school learning environment than girls and more often hold negative attitudes and perceptions towards school (Archambault et al. 2009), but because they are not less curious they have a higher tendency than girls to search for information elsewhere, to satisfy their curiosity.

Implications

Implications for theory and research

Much research in the fields of education and psychology focuses on self-efficacy, but insufficient studies specifically investigate the role of self-efficacy beliefs in important transitions in education, such as the transition from secondary school to university (Chemers, Hu, and Garcia 2001). We have demonstrated that NFC, academic out-of-school activities, and academic interest relate to students’ academic self-efficacy, but other personality, behavioural, or motivational factors also might increase students’ confidence in their ability to be successful university students. It would be worthwhile to establish which factors play a role and develop a more comprehensive model of the pathways to self-efficacy.

Furthermore, the stability of self-efficacy during a transition would be an interesting focus of study. Do students who graduate from pre-university with high levels of self-efficacy maintain these high levels through their first semester at university? On the one hand, the change in their learning environment and its accompanying demands could cause a disruption in students' sense of being competent learners (Christie et al. 2008). On the other hand, self-efficacy beliefs should transfer from one context to another, comparable context (Bandura 1977). The question thus becomes: are the secondary school and university learning environments comparable enough for students who are highly self-efficacious at the end of secondary education to avoid suffering a significant drop in their academic self-efficacy during the difficult transition?

Implications for practice

To raise students' self-efficacy with regard to being a successful university student, teachers could pay attention to enhancing the factors that relate to self-efficacy. Because NFC is a stable trait (Cacioppo and Petty 1982), it might be difficult for teachers to enhance students' NFC, although Elias and Loomis (2002) suggest that NFC still might be increased by teaching practices, such as making learning tasks enjoyable.

Academic interest also represents an important contributor to self-efficacy. Our results show that students undertaking humanities/social sciences coursework had significantly less academic interest than students doing science coursework, which may lead them to feel less self-efficacious once they enter university. The problem could be that these students are not (sufficiently) aware that disciplines such as modern languages and history are academically grounded and that academic activities, such as research, can be performed in these disciplines. They also might not be familiar with the ways of doing research in these disciplines. Teachers could raise this awareness by discussing important academic theories, interesting recent research findings, and enquiry methods as they relate to these disciplines, as well as requiring students to interact with the content in a more academic way, including research activities. Humanities and social science teachers could adopt the enquiry-based learning approach that is common in science courses, for example. Such practices may also have the positive side effect of disrupting the negative image of the humanities and social sciences as less academically prestigious than science.

Research into methods to trigger, enhance, and maintain interest highlights two main types of interest: situational, which is triggered by the environment and may last for a short period, and individual, or a person's long-lasting predisposition to re-engage with particular content over time. Situational interest always precedes individual interest (Hidi and Renninger 2006). Therefore, teachers should start by promoting situational interest, such as by creating a learning environment that makes the topic at hand interesting. For example, they should enhance task value

by placing knowledge in a context that is relevant to students' daily lives (Krapp and Prenzel 2011) or emphasising the utility of the content (Osborne, Simon, and Collins 2003). To trigger students' academic interest specifically, typical academic features should be related clearly to students' lives. The next step is to sustain this interest, so that it can develop into a long-lasting, individual interest. Creating situations that invite students to generate their own questions helps keep them interested (Hidi and Renninger 2006). Self-determination and a less restrictive learning environment are also important; Köller, Baumert, and Schnabel (2001) emphasised that a mismatch between the curriculum and students' interests prevents interest from enhancing academic learning. Better matched assignments can increase students' academic interest, as well as provide them with a more representative view of the world of academia and the academic way of thinking, which should enable them to clarify their own academic interests. Furthermore, attractive assignments that trigger students' interest will make them more engaged in their schoolwork, which has positive effects on their academic attitudes and behaviour, as well as their subsequent self-efficacy in being a successful university student.

The extent to which a student engages in self-initiated out-of-school academic activities also influences self-efficacy. To enhance students' extracurricular engagement, especially of girls and students whose parents do not have higher education backgrounds, teachers should make them familiar with the common presence of academic issues, across all subjects and domains of study. Finally, prior research also offers suggestions for directly enhancing self-efficacy, such as providing students with challenging academic tasks that are attainable with effort and fostering the belief that competence can be changed (i.e. growth mindset) (Linnenbrink and Pintrich 2003).

Limitations

This study is context specific; the research was carried out in a pre-university education setting, reflecting a specific track of secondary education in the Netherlands that prepares students for university. In addition, the relationships in this study are correlational. We cannot infer that one variable causes another, and many of the relationships might be turned around. However, our goal was to measure pathways towards academic self-efficacy, instead of using self-efficacy as a predictor, because the measure focused on expected efficacy in university students but study participants had not yet entered their university studies. Other variables that were not included in this study may also affect self-efficacy, so further research should include and investigate more variables. Finally, this study mainly focused on student variables, not contextual variables, such as the school environment or teacher practices. The only school variable that we included, coursework, influenced students' academic self-efficacy through its impact on academic interest. Although the knowledge that students doing science coursework have more

academic interest provides teachers (especially humanities and social sciences teachers) with important information, more practicable guidelines would require the inclusion of additional school variables.

Disclosure statement

No potential conflict of interest was reported by the authors.

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