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Impact of binding study advice on study behavior and pre-university education qualification factors in a problem-based psychology bachelor program

Björn B. de Koning*, Sofie M.M. Loyens, Remy M.J.P. Rikers, Guus Smeets and Henk T. van der Molen

Department of Psychology, Erasmus University Rotterdam, Rotterdam, the Netherlands

In the Netherlands, university programs increasingly use the binding study advice (BSA) to select students after the first year. Students with insufficient progress after the first year and who therefore do not conform to pre-defined BSA norms have to quit their program. This study investigated whether the introduction of the BSA is associated with differences in first-year study behaviors and students' pre-university education qualifications when entering university, which has to date been unexplored. Cohorts to which the BSA did (BSA group) or did not apply (pre-BSA group) in a problem-based psychology bachelor program were compared. Results showed that students' observed learning activities were rated higher by tutors after the BSA introduction than before. The BSA group did not spend more time on self-study and obtained lower course test scores than the pre-BSA group. At enrolment, differences were found in students' level of prior education but not with respect to their pre-university grades.

Keywords: higher education; binding study advice; selection

Students taking a relatively long time to complete their courses and leaving university without a degree or a diploma are perceived as a major problem in higher education (Organization for Economic Cooperation and Development 2008). In the Netherlands, almost half of university students leave before graduation and students who graduate exceed the nominally available time on average by 35% (Onderwijsraad 2008). This is similar to university graduation rates and average study durations reported in other European countries (Van den Berg and Hofman 2005) and at US higher education institutions (Attewell, Heil, and Reisel 2011). Yet, an adequate pace of progression and high graduation rates are important for individuals (i.e. formal qualification, study loan), universities (i.e. cost savings, funding), and society (i.e. return on investment in terms of highly educated individuals). As for Dutch universities, as in other European countries (see Hovdhaugen 2009), the amount of funding received from the government depends on the number of students who graduate, it is in the interest of universities to ensure that unnecessary study delays are avoided or kept to a minimum. Moreover, it is important for students to know as quickly as possible which field of study and which level of higher education are likely to yield the highest study progress and chances of successful graduation for them. This decreases the likelihood that students waste study years

*Corresponding author. Email: dekoning@fsw.eur.nl

unnecessarily and hence languish in the educational system for many years. Consequently, a measure called the binding study advice (BSA), which is aimed at identifying those students who underachieve in the first year as early as possible, has been introduced by several executive boards of Dutch universities in order to improve effectiveness and efficiency in higher education (Education Inspectorate 2009). In recent years, equivalent approaches for satisfactory academic progress have been adopted by an increasing number of higher education institutions worldwide (e.g. Federal Student Aid Handbook 2012). In the present study, we investigated the extent to which the introduction of the BSA is associated with differences in students' first-year study behaviors and their pre-university education qualifications when entering university.

The BSA as a tool for selection

According to the 1998 Law on Higher Education and Scientific Research (*Wet op het Hoger Onderwijs en Wetenschappelijk Onderzoek*), Dutch government-funded universities are required to provide each student with advice on the continuation of their studies by the end of the first year after enrolment. Universities can decide whether this advice is obligatory (i.e. BSA) or not (i.e. urgent advice). If a student has insufficient results or made insufficient progress, a negative warning is provided. In the case of an urgent negative warning being given, students are strongly recommended to terminate their studies and to switch to another course that better suits them, but students themselves decide whether or not to follow this advice. If the negative advice is binding it is referred to as a negative BSA. A negative BSA is obligatory and leads to the termination of a student's enrolment for the current program. Moreover, it means that the dismissed student cannot register for the same study program in the Netherlands for a certain period (often three years). The BSA thereby enables programs to continue with a group of talented and motivated students after the first year, whereas for students the BSA is a useful tool to learn at an early stage whether or not the program is appropriate for them. In this respect, the BSA is in line with the orienting, selecting, and referential function of the first study year of higher education in the Netherlands (Onderwijsraad 2008). Its use by educational institutes of higher education is therefore often legitimized by focusing on avoiding unnecessarily delayed withdrawal causing wastage of intellectual and financial resources for students and universities. The primary goal of a negative BSA is to identify underachieving students as early as possible and to advance the moment of withdrawal. Although it is not a primary aim of the BSA, it might also increase an institute's financial returns (Duijndam and Scheepers 2009; Education Inspectorate 2009).

The Dutch educational system preparing students for higher education is selective. Students are 'sorted' for continuing education, meaning that by following specific tracks in secondary education students are prepared for specific disciplines. Students who have completed senior secondary education or university preparatory education are automatically admitted to higher vocational education¹ or (research) universities² respectively. The premise underlying the BSA is that every student who has at least completed university preparatory education possesses sufficient intellectual capacities, perseverance, and discipline to successfully complete an academic program. An implication for higher education is that selecting students prior to university enrolment is (theoretically) unnecessary because students are expected to be sufficiently prepared for their upcoming academic study. Institutes of higher education, therefore, cannot refuse students who wish to enroll in the program. In the Netherlands, student selection

only takes place for certain programs requiring specific skills such as dance or sports, when the number of students wishing to enroll exceeds a pre-defined number of students that can be admitted, or for specialized programs such as medical school (Onderwijsraad 2008). The negative BSA is therefore considered to be extremely helpful in providing a first means for universities to select students after the first year of study based on their performance.

Whereas non-obligatory study warnings have been used for decades in Dutch higher education, an increasing number of institutes of higher education in the Netherlands use the BSA for selecting students after the first year. Research by the Education Inspectorate (2009) shows that in 2008, 80% of higher education institutes utilize a BSA, 98% of institutes for higher vocational education, and in scientific education at the Dutch universities this percentage has increased to 43%. In the last two years, interest in the BSA in scientific education has further increased. According to recent estimates, in the academic year 2007/2008 over 14,000 BSA warnings were issued in higher vocational education, and over 3900 in scientific education (Education Inspectorate 2009). The decision to issue a positive or a negative BSA is based on the number of study credit points (i.e. European Credits³ [ECs]) obtained by a student. The norm used by institutes of higher education is that students should at least obtain approximately two-thirds of the total number of ECs (i.e. 40 out of 60 ECs) during the first year to continue with their program; otherwise a negative BSA is issued. This norm varies by institution or even by program, and type of higher education. In higher vocational education, the criterion lies between 38 and 47 ECs, whereas scientific education works with a norm varying between 34 and 45 ECs (Education Inspectorate 2010).

Effectiveness of the BSA

Research on the effectiveness of the BSA is scarce, but the available evidence confirms the central goal of the BSA that students who underachieve can be identified relatively soon and leave early in the first year. For example, Duijndam and Scheepers (2009) investigated how the introduction of the BSA influenced students' study progress (i.e. EC) and moment of withdrawal during the first year in a business management program. Comparing cohorts before the BSA (when the BSA norm was not used) to cohorts using the BSA norm, they showed that in the BSA cohort students who withdrew from the program did so much earlier in the first year. This suggests that fewer students languish in the program due to the introduction of the BSA. However, this is only true when considering muddling on within the same program. According to Arnold and Van de Brink (2010), a negative BSA does not necessarily reduce the number of students muddling on in scientific education more generally. They showed that students who previously received a negative BSA also perform poorly in the first year of their next program (i.e. economics). Students who have already received a negative BSA in another program had lower study progress and withdrew more often from the economics program than students who were freshly enrolled from university preparatory education. These findings suggest that the BSA does not help students to choose a next program better. Because after a negative BSA students just switched from one scientific discipline to another within the same university, rather than choosing a study at a different level (e.g. higher vocational education), many students unsuccessfully keep languishing at university. Taken together, the BSA helps to quickly identify students with insufficient study progress and, hence to identify which programs are suitable for them, but it does not avoid scientific muddling more

generally. That is, the BSA does not help students in selecting a new program that better suits them after dismissal.

Furthermore, a study by Gijbels, Van der Rijt, and Van de Watering (2004) provides evidence that the BSA enables effective selection of students who have adequate study progress after the first year. In two cohorts (one in which the BSA was applied and one in which this was applied fictitiously) of first-year students from three different programs, the percentage of students successfully completing the first year (in a two-year period) and the number of ECs in the second year were examined. Results showed a similar pattern in the two cohorts: students who (would have) received a negative BSA (i.e. less than half of total first-year ECs) obtained lower numbers of ECs in the second year and a lower percentage of them successfully completed the first-year (after two years). These results indicate that the BSA can be effective in selecting a group of well-performing students.

Students' self-study time, learning activities, and the BSA

Despite these encouraging studies on the effectiveness of the main premises of the BSA, an aspect related to the introduction of the BSA that has hitherto been unexplored concerns students' study behavior. Nevertheless, prior research has shown that students' study behavior is relevant for dropout and transfer between programs (e.g. Pascarella and Terenzini 1991; Tinto 1987). Tinto (1987), for example, showed that the number of hours studied per week was positively associated with persistence. It has also been shown that students' learning activities and involvement in learning, both inside and outside the classroom, influences academic performance (e.g. Pascarella and Terenzini 1991). There is empirical evidence that the quality of student effort, such as additionally reading non-assigned literature to further one's understanding, has a direct relationship to student learning (e.g. Ory and Braskamp 1988). In general, the more students invest in learning activities, the greater is their likelihood of staying in college and/or obtaining good grades. A study by Suhre, Jansen, and Harskamp (2007) further indicates that study behaviors such as regularly studying increase student participation in educational activities (e.g. small-group work), which eventually results in higher numbers of credit points in the first year. In fact, currently there are a large number of studies showing that students' first-year study behaviors and achievements are strong predictors of students' performance in subsequent years (e.g. De Koning, Loyens, Smeets, Rikers, and Van der Molen 2012; Tinto 1975).

Consistent with this, according to the Education Inspectorate (2010), the usefulness of the BSA is characterized by the institutions' educational boards and policymakers as a big stick for students to make a success of at least their first year of study. Students should need to feel the threat of a negative BSA to put sufficient effort into their studies. In particular, the risk of getting a negative BSA should force students to approach their studies realistically. The BSA is thereby expected to help students to take their studies seriously. This suggests that differences might exist between the study behaviors engaged in by students confronted with the BSA compared to those who are not. If this is true, students to whom the BSA applies are likely to spend more time studying, resulting in higher numbers of self-study hours (Hypothesis 1). Moreover, adequately preparing for meetings, actively participating in group discussions, and providing high-quality contributions to these discussions will increase the likelihood that the subject matter at hand is adequately understood. Therefore, ratings of how well these activities are executed (i.e. observed learning activities; e.g. Loyens, Rikers, and Schmidt 2007)

are expected to be higher after the introduction of the BSA (Hypothesis 2). This study thus extends prior research by Loyens, Rikers, and Schmidt (2007), who have found positive relationships between self-study time and observed learning activities on the one hand and academic achievement on the other hand, since the current study is the first study to investigate these relations in the context of the BSA.

Furthermore, increased self-study time and more relevant study behaviors as reflected in higher ratings for students' observed learning activities are likely to result in higher knowledge test scores (Hypothesis 3). In other words, we expect the BSA to be related to both self-study time (i.e. the *quantity* of study activities) as well as to observed learning activities (i.e. the *quality* of study activities). Both the quantity and quality of study activities are expected to be associated with better test performance, which eventually is related to a higher number of study points.

Taking this one step further, it might even be the case that applying a BSA causes a self-selection effect on student enrolment. That is to say, students who are uncertain whether or not to apply for this particular study or have doubts about their capacities (e.g. because of low pre-university grades), or those who plan to take the program as a second study, might decide not to apply at all because of the risk of getting a negative BSA. In other words, setting a higher standard in the first year by requiring students to obtain a minimum number of ECs, might recruit students that are better prepared for university education.

In short, with respect to students' study behaviors, the present study investigated whether the introduction of the BSA encourages students to spend more time studying, show better observed learning activities, and hence obtain higher knowledge test scores, and a higher number of ECs. As a BSA warning is given at the end of the first year, we only looked at study behaviors and academic achievements prior to this advice. In addition, we explored whether changes could be observed in students' pre-university education qualifications in terms of their pre-university GPA, and type of pre-university education when entering university. If the BSA has a self-selection effect on student enrolment, students' pre-university GPA (Hypothesis 4a) and pre-university education (Hypothesis 4b) are likely to be higher in the BSA group.

Method

Sample

The data used in the present study were collected as part of the Generation Psy project in the psychology program of Erasmus University Rotterdam (EUR). In this research project information on students' demographic characteristics, study performance before and during higher education, study behaviors, personality, and intelligence were collected between 2003 and 2009 (for a detailed description of the project and database, see De Koning, Loyens, Smeets, and Van der Molen 2010). Data from four cohorts of psychology students have been used: the students who started the first-year psychology program in 2003, 2004, 2005, and 2006. As the BSA was officially introduced in the psychology bachelor program at the EUR in 2005, the students from the 2003 and 2004 cohorts represent a group of students to which the BSA did not apply (i.e. the pre-BSA group), whereas the students from the 2005 and 2006 cohorts represent a group of students to which the BSA did apply (i.e. the BSA group). So, in the 2005 and 2006 cohorts, students had to leave the psychology program at the

end of the first year if less than 40 ECs out of the maximum of 60 ECs had been obtained, but in the 2003 and 2004 cohorts no such BSA norm was used and all students could continue with their studies if they liked. Characteristics of the sample, divided into pre-BSA and BSA groups, are presented in Table 1.

Learning environment

The curriculum of the department of psychology consists of a three-year bachelor program and a one-year master's program. The curriculum is based on the principles of problem-based learning (PBL; Barrows 1985; Schmidt 1983; Schmidt et al. 2009) and uses a so-called block system in which one course (i.e. block) is programmed for five weeks. Each year consists of eight consecutive blocks. The starting point for the learning process in PBL is a complex, ill-structured problem. In each block, there are usually eight problems that are dealt with one at the time. As early as the first year, students discuss these problems in order to understand them in terms of the underlying theoretical explanations. This is done in small tutorial groups of approximately 10 students, which take place twice a week. During the first tutorial group meeting, students try to clarify unknown concepts, formulate a problem definition, brainstorm on the problem, and analyze the problem based on their general knowledge and/or knowledge obtained in previous courses. By activating relevant prior knowledge while discussing a problem, learners are encouraged to process new information and link this information to the knowledge they already possess (Schmidt et al. 1989). Hypotheses formulated during these initial discussions are allowed to be inaccurate or superficial, as long as they represent the conceptions student hold about the topic at hand. Expressing such misconceptions is important because this has been shown to facilitate the acquisition and revision of knowledge when presented with new and more accurate conceptions (Dole and Sinatra 1998). Based on this initial discussion, learning issues for individual study are formulated. To answer the learning issues, students individually need to select and study relevant literature about the topic at hand. After this period of self-study, usually lasting two days, students return to their

Table 1. Sample characteristics divided into pre-BSA and BSA groups.

Sample characteristics	Pre-BSA group	BSA group
Gender		
Male	140	130
Female	316	375
Nationality		
Dutch	444	485
Non-Dutch	10	19
Pre-university education		
University preparatory education	379	382
Higher vocational education	57	80
Other training	19	34
Age (in years)	19.94 (2.31)*	20.11 (2.50)*

Note: * This value represents the mean age. Standard deviations are presented in brackets.

tutorial group, critically review and share what they have learned, and elaborate on it together with their fellow students. Possible misconceptions that emerged during the initial discussion of the problem are now resolved as well. The whole process takes place under the guidance of a tutor who stimulates the discussion, provides students (if necessary) with just-in-time content information, and evaluates the progress. A tutor also monitors the extent to which each group member is prepared for and contributes to the discussion (i.e. observed learning activities; Loyens, Rikers, and Schmidt 2007).

Because problems steer learning in the PBL curriculum, the number of lectures are limited (i.e. once a week). Lectures are not obligatory and are intended only to clarify difficult issues that remain after students have worked on a particular problem, deepen, or broaden students' understanding of the topics studied. The small number of lectures is in line with the idea that learning is to be student initiated and that ample time for self-study should be available (e.g. Barrows 1985). Other activities during a block include practical courses in which specific professional skills (e.g. interview techniques, psychological assessment) are taught.

Variables

Pre-university education qualification factors

Two variables with respect to students' pre-university education qualifications to the psychology program were retrieved from the university administration. The variables included students' pre-university grade point average (GPA) and type of pre-university education. These variables provide information on the prior learning achievement of students entering the psychology program and hence were used for examining potential differences in students' pre-university education qualification when entering university arising from the introduction of the BSA.

Students' pre-university GPA was based on the courses and accompanying grades of their final exams in secondary education. At the student level, a grade point average (GPA) over all courses was calculated, reflecting students' pre-university GPA. Students' pre-university education was defined as the latest preparatory education giving access to university. A distinction was made between university preparatory education (i.e. VWO), higher vocational education (i.e. HBO), and another pre-university education (e.g. foreign diploma).

Study behavior factors

Five variables regarding students' study behaviors and performance were retrieved from the student administration: students' self-study time, their observed learning activities, course test grades, knowledge progress test scores, and the number of obtained ECs. Examining these variables allows us to investigate whether the introduction of the BSA has led students to take a more serious approach to their studies, for example resulting in higher numbers of self-study hours, more relevant study behaviors before (i.e. better preparation) and during (i.e. discussing the subject-matter) meetings, as well as higher grades on knowledge tests, and a higher number of ECs.

Time spent on individual study was measured by a self-report procedure. After each block of five weeks, students were asked to estimate the average amount of time spent on individual study per week during that block, besides the curricular activities engaged in such as tutorial meetings, lectures, and practical sessions. For each student, a mean

score on the number of reported self-study hours was calculated for the first bachelor year. A study of Moust (1993; also see Gijsselaers and Schmidt 1995), showed that this method provides a reliable and reasonable valid indicator of actual individual self-study time.

Observed learning activities undertaken by each student were measured in a way similar to Loyens, Rikers, and Schmidt (2007). During each block, students are evaluated by a tutor on (1) their preparation with respect to the subject matter studied, (2) how active and motivated they were in terms of participating in the tutorial group discussions, and (3) how well they fulfilled their role of chair and scribe during these meetings. At the end of each block, tutors rated their students for these three dimensions on a 26-item rating scale ranging from 1 (student did not show these activities at all) to 5 (students showed these activities to a large extent), which ultimately results in an individual grade (1–10) for each student's observed learning activities during that block. No ECs are awarded to students' observed learning activities, but endorsement is required for course completion. Endorsement is obtained if student's observed learning activities GPA, calculated over the individual grades over four blocks, equals 5.5 or higher. Based on these averaged grades, in this study, an observed learning activities GPA over the first bachelor year was calculated for each student.

A student's course test grades obtained after each block were used to calculate their course test GPA. The grade obtained on the course test can vary from 1 to 10. Because the course test is formative, no ECs are awarded to the scores on the course test. For each student, we have calculated a mean score for the first bachelor year based on all of an individual's course test scores within this year.

During the first two bachelor years, the main assessment tool in the psychology curriculum is the knowledge progress test (KPT) (Schmidt 1995; Van der Vleuten, Verwijnen, and Wijnen 1996). The KPT is taken four times a year and assesses whether students have good study progress and ultimately whether they have sufficient knowledge and understanding of the basic subjects of the psychology curriculum. The KPT assesses long-term knowledge and consists of 180 true/false/question-mark (i.e. 'I don't know') questions that cover the content of all the courses of the first two bachelor years. For each correct response to a KPT item, one point is awarded, whereas an incorrect answer results in one point reduction. The question mark is awarded zero points. The scores on the KPT can therefore range from –180 to +180. In this study, we have calculated a mean KPT score for each student based on their individual scores on all KPTs in the first bachelor year. For each student, we also collected the number of ECs obtained in the first bachelor year. The scores of this variable could range from 0 to 60.

Statistical analysis

In order to investigate whether the introduction of the BSA has led to changes in students' pre-university education qualifications when entering university, we compared type of pre-university education and students' pre-university GPA between the pre-BSA and BSA groups using chi-square analysis and analysis of covariance (ANCOVA) with pre-university education as a covariate.

In order to investigate whether the introduction of the BSA has led to increased effort, more appropriate study behaviors, and higher achievement, we compared the students' number of self-study hours, observed learning activities GPA, course test GPA, KPT scores, and the number of ECs between the pre-BSA and BSA groups

using multiple analysis of covariance (ANCOVA) with students' pre-university education as a covariate.

Results

Relationship between BSA and pre-university education qualifications

Regarding students' pre-entry qualifications (see Table 2), a significant relationship was found for the type of students' pre-university education and introduction of the BSA ($\chi^2 = 9.97$, $df = 2$, $p < .05$). Within the BSA group, a smaller proportion of the students enrolled into the program from university preparatory training, and a larger proportion of students did so with higher vocational education or another pre-university education (e.g. foreign diploma) than within the pre-BSA group, which confirms Hypothesis 4a. Because of these significant differences, the variable pre-university education was taken up as a covariate in further analyses. In contrast to Hypothesis 4b, the ANCOVA on students' pre-university GPA showed no significant differences between the BSA group and the pre-BSA group ($F(3, 952) = .42$, $MSE = .18$, $p > .05$). This suggests that the introduction of the BSA did not attract or discourage students with better pre-university learning performance, that is, those with higher pre-university GPA.

Influence of the BSA on study behavior

As can be seen from Table 2, our analyses regarding students' study behaviors do not completely support our expectations. In line with our second hypothesis, students in the BSA group show a significantly higher observed learning activities GPA than the pre-BSA students ($F(3, 952) = 4.09$, $MSE = .30$, $p < .05$, $\eta_p^2 = .004$), suggesting that students in the BSA group were better prepared for and contributed better to the tutorial group discussions. However, this was not accompanied by differences in self-study time: students in the BSA group did not spend significantly more time studying than pre-BSA students ($F(9, 952) = 2.51$, $MSE = 37.89$, $p > .05$), which is opposite to our first hypothesis.

Table 2. Descriptive statistics for the study behavior variables, and pre-university education qualifications for the pre-BSA and BSA groups.

	Pre-BSA group		BSA group	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<i>Pre-university education qualifications</i>				
Pre-university GPA (1–10)	6.68	.43	6.66	.42
Pre-university education*	—	—	—	—
<i>Study behavior</i>				
Self-study time (in hours)	13.09	6.72	13.74	5.59
Observed learning activities (1–10)	7.46	.58	7.53	.51
ECs (0–60)	50.20	18.38	47.12	19.82
Course test GPA (1–10)	6.28	1.07	6.07	1.17
Knowledge Progress Test score (–180 to +180)	26.25	9.19	25.46	8.68

Note: * This is a categorical variable and therefore values are not provided.

Regarding study outcomes (see Table 2), no significant differences were found on the KPT scores between the BSA and the pre-BSA groups ($F(3, 952) = 1.98$, $MSE = 79.85$, $p > .05$). The analyses on the course test GPA and the number of EC even show results that are opposite to our expectations (Hypothesis 3). A significantly higher course test GPA ($F(3, 952) = 8.81$, $MSE = 1.26$, $p < .05$, $\eta_p^2 = .009$) and higher number of EC ($F(3, 952) = 6.61$, $MSE = 336.83$, $p < .05$, $\eta_p^2 = .007$) were obtained by students in the pre-BSA group than in the BSA group. It is important to note, however, that in both groups, on average the course test GPA is sufficient (> 5.5) and the number of EC exceeds the required BSA norm of 40 EC.

In sum, these findings suggest that, except for the observed learning activities employed by students, students' study behaviors and performances were not positively influenced by the introduction of the BSA.

Discussion

This study investigated whether the introduction of the BSA is associated with changes in students' study behaviors and achievements during the first year as well as their pre-university education qualifications when entering university. Therefore, different cohorts to which the BSA did or did not apply in a problem-based psychology bachelor program were compared on these aspects.

Results showed that the introduction of the BSA did influence students' study behavior, although this effect was not found for all variables. Tutors rated students' preparation for and participation in the group discussions (i.e. observed learning activities) higher after the BSA had been introduced (Hypothesis 2), suggesting that students have changed their study activities during and outside the tutorial meetings. Because students did not spend more time on self-study after the introduction of the BSA (Hypothesis 1), it seems likely that they have used the self-study time more efficiently, for example by engaging in qualitatively different study strategies, such as contrasting the content of different chapters on the same topic or identifying weak and strong points in studied theoretical explanations, that better prepared them for the group meetings and allowed them to discuss the subject matter they had studied more thoroughly. In fact, prior research (De Koning et al. 2012) has shown that tutors' ratings of students observed learning activities are among the strongest predictors of first year as well as subsequent academic achievement. Observed learning activities might therefore provide a good indication of students' study activities, and hence their performance. Similarly, using a Norwegian sample, Hovdhaugen (2009) showed that increased student activity and effort reduces the probability of dropping out. Nevertheless, future research using direct measures on the quality of students' self-study or the exact strategies they use is needed to investigate this issue further.

Using academic achievement as a dependent variable, this study showed that students, to which the BSA applied, obtained at best the same performances as those to which the BSA did not apply. Students did thus not obtain better performances after the introduction of the BSA (Hypothesis 3). This does not necessarily imply that fewer students can enroll in the second year or will graduate eventually. Although the number of credit points (i.e. EC) obtained after the introduction of the BSA is lower, on average students meet the required BSA norm of 40 EC and they still obtain a sufficient grade on the course test. An interesting conclusion is that if study behaviors actually have (positively) changed after the introduction of the BSA as indicated by results on observed learning activities, it is evident from our study that this

does not necessarily translate into increased levels of performance. Rather, sufficient performance to meet the BSA requirement might then be valued as more important for students than acquiring as much knowledge and, hence highest performances, as possible. However, it has been shown that first-year grades are very important predictors of students' achievements in the second and third bachelor years (De Koning et al. 2012). At the institutional level, universities could thus inform students about the importance of obtaining high grades or encourage them to perform maximally.

A second issue addressed in the present study was whether the introduction of the BSA has a selective effect on student pre-university education qualifications at the moment of enrolment. Students' pre-university grades, which are highly predictive of subsequent academic achievement (e.g. De Koning et al. 2012; McKenzie and Schweitzer 2001), were similar in the cohorts to which the BSA did or did not apply (Hypothesis 4a). This suggests that the introduction of the BSA has not created an upward or downward shift in the level of knowledge students' started with at university. However, changes were observed in the type of pre-university education students had completed before enrolment at university (Hypothesis 4b), indicating that after the BSA had been introduced fewer students with university preparatory education enrolled into the psychology program. It is unclear whether this change is directly related to the introduction of the BSA or other aspects such as that the psychology program has become more well-known as an interesting alternative to socially oriented studies in higher vocational education a few years after it started in 2001. Nevertheless, it is important to take this aspect into account when evaluating the effectiveness of the BSA, as it has been shown that students with pre-university education other than university preparatory education perform worse throughout the bachelor degree than those with university preparatory education (De Koning et al. 2012).

This study makes an important contribution to educational research and policy regarding the application and evaluation of the BSA. Rather than investigating financial returns or whether the right students are selected using the BSA (e.g. Gijbels et al. 2004), this study provides a first attempt to gain more insight into the influences of the introduction of the BSA on the actual learning process, that is, students' study behaviors as well as their academic achievement and pre-university education qualifications. Currently, relatively little is known about these aspects in relation to the BSA. Our findings show that, at least for the sample investigated in this study, using the BSA to try to identify students with insufficient progress as early as possible, results in (qualitatively) different study behaviors. At the same time, however, adverse effects might be introduced by the BSA such that students just try to meet the required BSA norm rather than obtain the best possible performance. Although this retrospective study aimed to relate changes in study behavior and pre-university qualifications to the introduction of the BSA, it is possible that other factors or events occurring at the same time may also have influenced the observed findings. However, we do not have any indications that the observed changes were driven by factors other than the introduction of the BSA. Nevertheless, future research is warranted to provide more insight into this issue. Further research should also shed more light on the potential mechanisms underlying these findings and need to test the generalizability of these findings to samples from other disciplines and programs that do not use problem-based learning.

Notes

1. Dutch institutes of higher vocational education are aimed at educating and preparing students for a specific profession and are practically oriented. These bachelor studies have a

length of four years of full-time studying and each year matches 60 ECs. A bachelor degree at universities of applied professions thus requires 240 ECs.

2. Scientific bachelor's programs at (research) universities take three years of full-time studying. One year of bachelor study matches 60 ECs, that is, a study load of 1680 hours; a bachelor's degree requires 180 ECs (i.e. 5040 hours of studying). When successfully completed a bachelor program, students obtain a bachelor's degree and they usually continue with a scientific master's, which takes one (60 ECs) or two (120 ECs) years of full-time studying.
3. European Credits (EC) are part of the European Credit Transfer System (ECTS), which is a standard for comparing study performance of students in higher education across the European Union and other collaborating European countries. ECs refer to the study load in higher education. One European Credit (EC) is equivalent to a study load of 28 hours.

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