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BIS- and BAS-activation and study outcomes: A mediation study

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ABSTRACT

Building on Gray's original Reinforcement Sensitivity Theory, we examined how individual differences in students' activation of the behavioral inhibition (BIS) and the behavioral approach (BAS) systems relate to overcommitment to one's studies and study engagement, and how these two forms of heavy study investment relate to three academically relevant outcomes. Using data from 565 Dutch university students, structural equation modeling showed that BIS-activation was positively associated with overcommitment to one's studies, which in turn was positively related to exhaustion and the intention to quit one's studies. BAS-activation was positively associated with study engagement, which in turn was negatively related to exhaustion and the intention to quit, and positively related to academic performance. Bootstrapping techniques revealed a mediating role of the two forms of heavy study investment. Apparently, BIS- and BAS-activation are associated with heavy study behavior, student well-being, and study outcomes.

1. Introduction

Building on Gray's (1987) original Reinforcement Sensitivity Theory, this study examines how individual differences in activation of the behavioral inhibition system (BIS) and behavioral approach system (BAS) influence students' functioning. We investigate whether the relations between BIS- and BAS-activation and three academically relevant outcomes (exhaustion, the intention to quit one's studies, and academic performance) are mediated through two forms of heavy study investment (overcommitment to one's studies and study engagement). By doing so, we aim to provide insight into the motivational antecedents and consequences of heavy effort expenditure.

1.1. Personality

Gray's (1987) Reinforcement Sensitivity Theory (RST) explains the nature of individual differences at the neurobiological level. It posits that anxiety and impulsivity are two basic dimensions of personality that correspond with individual differences in the sensitivity of two neurobiological systems to specific sets of stimuli. The *behavioral inhibition system* (BIS) responds to anxiety-provoking stimuli: it is reactive to conditioned stimuli associated with punishment, nonreward, and novelty, and inhibits movement toward goals that may lead to negative outcomes. Hence, the BIS controls aversive motivation. Furthermore, the BIS is associated with negative feelings such as anxiety, frustration, and sadness in response to anxiety-provoking stimuli (Carver & White, 1994). The *behavioral approach system* (BAS) responds to conditioned stimuli associated with reward, nonpunishment, and escape from punishment. It stimulates movement toward goals that may lead to positive outcomes, and impulsivity is the main dimension involved in this system (Franken, Muris, & Rassin, 2005). Hence, the BAS controls appetitive motivation. Furthermore, the BAS is associated with positive feelings such as hope, elation, and happiness (Carver & White, 1994). The third system in Gray's (1987) theory is the *fight–flight system* (FFS). The FFS is reactive to unconditioned, aversive stimuli and it is associated with defensive aggression or escape behavior (Smillie, Pickering, & Jackson, 2006). This system accounts for the experience of rage and fear, but has never clearly been related to personality.

When revising the original RST, Gray and McNaughton (2000) proposed that the BAS responds to appetitive stimuli, whereas the FFS reacts to aversive stimuli (Corr, 2004). The FSS also incorporates a freeze response and is referred to as the *fight–flight–freeze system* (FFFS). In the revised RST, the BIS responds to conflict, e.g., situations that include both reward (BAS) and punishment (FFFS) contingencies (Heym, Ferguson, & Lawrence, 2008). When activated, it inhibits ongoing behavior, directs attention to the conflicting sources, and weighs reward and punishment against each other, leading to approach or avoidance behavior (Keiser & Ross, 2011).

Although these revisions are notable, they are not necessarily at variance with previous understandings of RST (Smillie et al., 2006). Furthermore, it is difficult to distinguish anxiety (BIS) from fear

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(FFFS) with techniques other than pharmacological methods and direct lesion. Conceptually and psychometrically they are often assumed to be similar: in practice the BIS often implicitly covers both systems. Due to these practical and theoretical reasons, this study draws on Gray's (1987) conceptualization of the RST.

1.2. Personality and study effort

BIS- and BAS-sensitivity involve motivational dispositions (Heimpel, Elliot, & Wood, 2006), and may therefore be relevant to students' academic functioning. The present study includes two such dispositions: overcommitment to one's studies and study engagement.

Overcommitment to one's studies involves being obsessed with one's studies and studying compulsively and excessively: it refers to a strong and uncontrollable inner drive to study hard (Schaufeli, Shimazu, & Taris, 2009). Since study activities strongly resemble work activities (both students and employees are involved in structured, coercive activities that require substantial effort to achieve specific goals: Salanova, Schaufeli, Martínez, & Bresó, 2010), study overcommitment is similar to the concept of workaholism.

Low self-esteem and high fear of failure are assumed to underlie working in an obsessive–compulsive manner (Killinger, 2006). These characteristics are also associated with high BIS-activation. Students with high BIS-activation are assumed to be biased toward negative attributes when evaluating themselves and to have strengthened self-protection concerns (Heimpel et al., 2006). They are likely to pursue goals that lead to avoiding negative evaluations or to achieving positive evaluations (Elliot & Church, 1997). To prove their competence and to reduce their concerns about failure, students with high BIS-activation might be overcommitted to their studies (cf. Elliot, McGregor, & Gable, 1999). Therefore, *BIS-activation will be positively associated with overcommitment to one's studies* (Hypothesis 1).

Study engagement is characterized by study-related vigor (i.e., high levels of energy and mental resilience), dedication (i.e., high involvement), and absorption (i.e., being fully concentrated and engrossed in one's studies; Schaufeli, Martínez, Marques-Pinto, Salanova, & Bakker, 2002). This conceptualization is similar to that of work engagement.

High self-esteem, self-efficacy, and optimism stimulate engagement (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007). These personal resources are believed to be influenced by BAS-activation. Students with high BAS-sensitivity are presumed to be biased toward positive attributes when evaluating themselves and to hold self-enhancement concerns (Heimpel et al., 2006). They are likely to pursue goals that relate to the development of competence and task mastery, and that are linked to achieving positive evaluations (Elliot & Church, 1997). This might be reflected in a greater proneness to experience engagement (see also Elliot et al., 1999; Wolters, 2004). Since BAS-activation is positively related to employee engagement (Van der Linden, Beckers, & Taris, 2007), *BAS-activation will be positively associated with study engagement* (Hypothesis 2).

1.3. Study effort and outcomes

Meijman and Mulder's (1998) effort-recovery model proposes that goal-directed behavior requires effort expenditure that leads to two types of outcomes: it may bring about the desired goal, and it will result in short-term physiological and psychological reactions. These short-term reactions signify that recovery from effort expenditure is needed. Recovery occurs when individuals have a rest or switch to other activities. However, prolonged high effort expenditure combined with insufficient opportunities for recovery means that additional effort is needed to reach one's goals. Consequently, physiological and psychological reactions accumulate and the need for recovery increases. Ultimately, this may have adverse consequences for health and well-being.

Following this reasoning, differences in BIS- and BAS-activation may affect students' exhaustion levels through the two forms of heavy study investment discussed above. Students who are overcommitted to their studies study excessively and compulsively, and should find it difficult to disengage from their study activities (Scott, Moore, & Miceli, 1997). This might be explained by their hypothesized BIS-sensitivity. They might be continuously reminded of negative possibilities that tend to provoke threat appraisals and anxiety (Heimpel et al., 2006). Consequently, they may have little time for recovery (Scott et al., 1997), leading to the accumulation of physiological and psychological reactions, possibly resulting in exhaustion. Hence, *overcommitment to one's studies will be positively associated with exhaustion* (Hypothesis 3).

Engaged students possess high levels of energy and mental resilience (Schaufeli et al., 2002). Furthermore, previous research found that engaged workers experience little work-home interference and do spend time on leisure activities (Schaufeli et al., 2001). Thus, engaged students should be able to disengage from their study activities. Their expected BAS-sensitivity might facilitate the development of a positive self-view in several ways, including directing students toward positive objects and opportunities (e.g., social relationships) in the environment (Heimpel et al., 2006). Consequently, engaged students will recover sufficiently from their effort expenditure and they will be less vulnerable to exhaustion than others. Thus, *study engagement will be negatively associated with exhaustion* (Hypothesis 4).

Further, students who are overcommitted to their studies will find their study activities neither enjoyable nor interesting (Van Beek, Hu, Schaufeli, Taris, & Schreurs, 2012), and will struggle with unfavorable study conditions (Schaufeli, Taris, & Van Rhenen, 2008), including high demands (e.g., study load). Their expected sensitivity to stimuli associated with punishment, nonreward, and novelty might account for these findings. Consequently, *overcommitment to one's studies will be positively associated with the intention to quit one's studies* (Hypothesis 5).

Conversely, engaged students will personally value their study activities and consider them enjoyable and satisfying (Van Beek et al., 2012). Furthermore, they report favorable environmental conditions (Salanova et al., 2010): they can draw upon abundant resources and they experience relatively low demands. Their expected sensitivity to stimuli associated with reward, nonpunishment, and escape from punishment might explain these findings. Therefore, *study engagement will be negatively associated with the intention to quit one's studies* (Hypothesis 6).

As regards performance, individuals who engage in an activity because of self-protection concerns are detracted from performing effectively (Gagné & Deci, 2005). They might doubt their ability to achieve their goals and could therefore not be committed to these (Erez & Judge, 2001). Since negative self-evaluations and self-protection concerns are related to obsessive–compulsive study behavior, overcommitted students may perform worse than others. Hence, *overcommitment to one's studies will be negatively associated with academic performance* (Hypothesis 7).

Conversely, individuals with positive self-regard and who find their activities attractive, put relatively much effort in reaching their goals and are therefore likely to succeed (Erez & Judge, 2001). Thus, *study engagement will be positively associated with academic performance* (Hypothesis 8). Figure 1 summarizes our hypotheses.

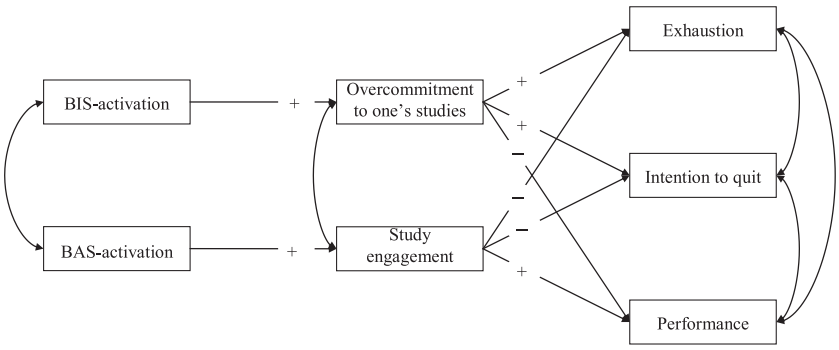

Fig. 1. Research model.

2. Method

2.1. Participants

Students were recruited from different faculties and studies. They were asked individually whether they would like to complete a questionnaire about their study experiences. They received no compensation for their participation. The sample included 565 Dutch university students (68.1% female, M_{age} was 21.0 years, SD = 2.2). Most participants (82.5%) were enrolled in an undergraduate/bachelor program.

2.2. Instruments

BIS- and *BAS-activation* were measured with Franken et al.'s (2005) Dutch translation of Carver and White's (1994) BIS/BAS scales. This questionnaire taps the BIS (7 items) and BAS (13 items). According to Carver and White (1994), the BAS-items cover three concepts: fun seeking, reward responsiveness, and drive. Since the distinction among these subscales lacks empirical evidence and relevance (Van der Linden et al., 2007), the overall BAS-scores were used. Items were scored on a 4-point scale (1 = "I do not agree at all", 4 = "I totally agree").

Overcommitment to one's studies was measured with an adaptation of the Dutch Work Addiction Scale (DUWAS; Schaufeli et al., 2009) which taps workaholism among employees. The DUWAS includes two subscales, Working Excessively (9 items) and Working Compulsively (7 items). The items were reworded to refer to the academic context.

To examine the factor structure of this scale, the sample was randomly split into two. Drawing on the first half of the sample (N = 283), covariance structure analysis (AMOS; Arbuckle, 2007) showed that a one-dimensional model fitted the data equally well as a two-dimensional model (χ^2 (N = 283, df = 104) = 405.2, TLI = .75, CFI = .78, RMSEA = .10; $\Delta\chi^2$ (N = 283, df = 1) = 3.65, p > .05). The more parsimonious one-factor model was therefore preferred. Items showing low loadings on the latent factor (<.40) or high overlap with other items (as evidenced by significant modification indices) were removed. The resulting one-factor model fitted the data well (χ^2 (N = 283, df = 14) = 39.34, TLI = .93, CFI = .95, RMSEA = .08). Table 1 presents the scale items and their loadings. The reliability of this scale was good (α = .82). This 7-item, one-factor model was then cross-validated using the second half of the sample (N = 282). A single-factor solution was acceptable (χ^2 (N = 282, df = 14) = 39.12, TLI = .93, CFI = .95, RMSEA = .08), as was its reliability (α = .80). Summarizing, overcommitment to one's studies can reliably be measured with a 7-item scale (the Dutch Work Addiction Scale for students, DUWAS-S). Items were scored on a 4-point scale (1 = "(almost) never", 4 = "(almost) always").

Study engagement was measured with the 9-item Utrecht Work Engagement Scale – Student version (cf. Schaufeli et al., 2002; Schaufeli, Bakker, & Salanova, 2006). Although this questionnaire taps vigor, dedication, and absorption, engagement can be assessed with a composite score. Items were scored on a 7-point scale (0 = "never", 6 = "always").

Exhaustion was measured with the 5-item Exhaustion Scale of the Utrecht Burnout Scale – Student version (Schaufeli & Van Dierendonck, 2000). Items were scored on a 7-point scale (0 = "never", 6 = "always").

Intention to quit was measured with 3 items devised by Van Veldhoven and Meijman (1994) to examine employees' turnover intention. These were reworded to refer to students' intention to quit their studies (1 = "completely disagree", 7 = "completely agree"). E.g., the item "I sometimes think about changing my job" became "I sometimes think about quitting my studies".

Study performance was measured as the average of the grades participants received for their last four courses (range varying from 1 to 10). Thus, study performance referred to their performance during the six months preceding the present study. This number of grades was chosen because incorporating more grades could reduce the accuracy of this measure due to memory effects, whereas a smaller number might increase the chances of bias due to outliers.

2.3. Statistical analyses

Table 2 presents the descriptive statistics. Preliminary analyses indicated that the data were approximately normally distributed. The hypotheses were tested using covariance structure analysis methods (AMOS; Arbuckle, 2007) and maximum likelihood estimation methods. Our initial model (Fig. 1) fitted the data well

Table 1
Items and factor loadings of the DUWAS-S.

Items	Exploratory sample N = 283	Confirmatory sample N = 282
1. I study much harder than my fellow students*	.59	.44
2. It is important to me to study hard, even when I do not enjoy it**	.74	.73
3. I find myself thinking about my studies even when I want to get away from them for a while**	.51	.46
4. I seem to have an inner compulsion to study hard: I have to, whether I want to or not**	.79	.83
5. I put myself under pressure with self-imposed deadlines*	.57	.52
6. I feel obliged to study hard, even when it is not enjoyable**	.67	.72
7. It is hard for me to relax when I am not studying*	.48	.53

* Item was adapted from the Working excessively scale.
** Item was adapted from the Working compulsively scale.

Table 2
Means (M), standard deviations (SD), internal consistencies (on the diagonal) and correlations between the variables (N = 565).

Variable		M	SD	1	2	3	4	5	6	7
Personality										
1	BIS-activation	2.84	.57	*.81*						
2	BAS-activation	3.02	.36	−.10*	*.76*					
Heavy study investment										
3	Overcommitment to one's studies	2.09	.59	.30*	.05	*.81*				
4	Study engagement	3.34	.96	−.03	.19*	.23*	*.89*			
Outcomes										
5	Exhaustion	2.03	1.05	.29*	.03	.42*	−.08	*.80*		
6	Intention to quit	2.42	1.33	.07	.02	.03	−.34*	.24*	*.73*	
7	Performance	6.95	.81	.02	−.03	.08	.24*	−.16*	−.15*	–

* $p < .05$.

(χ^2 (N = 565, df = 8) = 29.78, TLI = .86, CFI = .95, RMSEA = .07). The modification indices suggested an additional direct relation between BIS-activation and exhaustion. This adjusted model fitted the data significantly better than the original model (χ^2 (N = 565, df = 7) = 13.46, TLI = .95, CFI = .98, RMSEA = .04; $\Delta\chi^2$ (N = 565, df = 1) = 16.32, $p < .05$). Finally, non-significant paths (overcommitment to one's studies → performance and intention to quit ↔ performance) were removed, resulting in a final model that met the criteria for good fit (χ^2 (N = 565, df = 9) = 17.58, TLI = .95, CFI = .98, RMSEA = .04).

To examine the indirect effects of BIS- and BAS-activation on exhaustion, intention to quit, and academic performance through overcommitment to one's studies and study engagement, bootstrapping techniques (2000 iterations) were used (Preacher & Hayes, 2008). When testing the indirect effect of BIS-activation on exhaustion, the path coefficient for the direct effect of BIS-activation on exhaustion was set to zero.

3. Results

Figure 2 presents the results for the final model, including only statistically significant paths ($p < .05$). Hypothesis 1 stated that BIS-activation would be positively associated with overcommitment to one's studies. Figure 2 shows that this hypothesis was confirmed (β = .31). Furthermore, Hypothesis 2 stated that BAS-activation would be positively associated with study engagement. Likewise, the analyses supported this expectation (β = .18). Hence, students with high BIS-activation score high on overcommitment, whereas students high on BAS-activation score high on engagement.

Hypotheses 3 and 4 focused on the association between study investment and well-being. As expected, overcommitment to one's studies was positively related to exhaustion (β = .41), whereas study engagement was negatively linked to exhaustion (β = −.16) (Hypotheses 3 and 4 confirmed).

Hypothesis 5 predicted that overcommitment to one's studies would be positively associated with the intention to quit one's studies. As expected, these variables were positively related (β = .11). Furthermore, Hypothesis 6 that proposed that study engagement would be negatively associated with the intention to quit one's studies was also supported (β = −.36).

Lastly, whereas overcommitment to one's studies and academic performance were unrelated (Hypothesis 7 rejected), Hypothesis 8 (that proposed that study engagement would be positively associated with academic performance) was confirmed (β = .24). Thus, overcommitted students score high on exhaustion and intention to quit, whereas engaged students score low on these two outcomes and high on academic performance.

3.1. Direct versus indirect effects

Further, we found a direct effect between BIS-activation and exhaustion. Students with high scores on BIS-activation reported higher levels of exhaustion than others (β = .15). Regarding the indirect effects, Table 3 shows that all mediated paths presented in Fig. 2 were significant. Two main trends are visible. First, the indirect paths linking BIS-activation to exhaustion and to intention to quit via overcommitment to one's studies were positive (indirect effects of .14 and .03, respectively), indicating that high BIS-activation is associated with negative outcomes. Second, the indirect paths linking BAS-activation to exhaustion and to intention to quit via study engagement were negative (indirect effects of −.03 and −.06, respectively), whereas the indirect path linking BAS-activation to academic performance via study engagement was positive (an indirect effect of .04). Thus, high BAS-activation is related to positive outcomes.

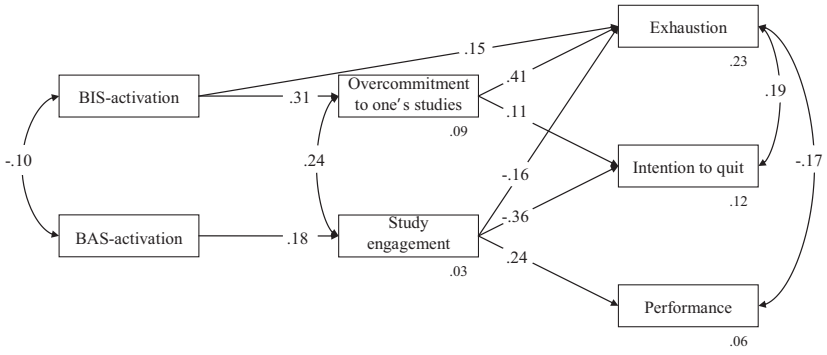

Fig. 2. Final model with standardized path coefficients and squared multiple correlations. All paths are significant at $p < .05$.

Table 3
Estimates and confidence intervals for the indirect associations ($N = 565$).

x	Mediator m	Outcome y	Bootstrapping		95% CI	
			Estimate	SE	Lower	Upper
BIS-activation	Overcommitment to one's studies	Exhaustion	.14*	.02	.10	.19
		Intention to quit	.03*	.01	.01	.06
BAS-activation	Study engagement	Exhaustion	−.03*	.01	−.05	−.01
		Intention to quit	−.06*	.02	−.10	−.03
		Performance	.04*	.01	.02	.07

* $p < .01$.

4. Discussion

Building on Gray's (1987) original Reinforcement Sensitivity Theory, the present study examined how individual differences in BIS- and BAS-activation relate to overcommitment to one's studies and study engagement, and how these two types of heavy study investment relate to exhaustion, the intention to quit one's studies, and academic performance. The main findings are the following.

First, BIS-activation was positively associated with overcommitment to one's studies. Apparently, students who are sensitive to potentially threatening situations and negative outcomes of their behavior, and who are motivated to avoid such situations and outcomes (McNaughton & Corr, 2004) are likely to be overcommitted. Furthermore, BAS-activation was positively associated with study engagement, suggesting that students who are sensitive to positive incentives and who are motivated to achieve positive outcomes are likely to be engaged. Thus, the present study suggests that aversive motivation is accompanied by overcommitment to one's studies and appetitive motivation is accompanied by study engagement.

Second, overcommitment to one's studies was positively associated with exhaustion, whereas study engagement was negatively associated with exhaustion. This supports the reasoning that overcommitted students spend much effort on their studies while taking insufficient opportunities for recovery (Scott et al., 1997), resulting in exhaustion (Meijman & Mulder, 1998). Conversely, engaged students seem less vulnerable to exhaustion, suggesting that they have sufficient opportunities to recover from their effort expenditure (Schaufeli et al., 2001).

Third, overcommitment to one's studies was positively associated with the intention to quit one's studies, whereas study engagement was negatively associated with the intention to quit. Their low levels of intrinsic motivation (Van Beek et al., 2012) and unfavorable study conditions (Schaufeli et al., 2008) might explain why overcommitted students have a relatively strong intention to quit their studies. Since engaged students tend to value and enjoy their study activities (Van Beek et al., 2012), and experience favorable study conditions (Salanova et al., 2010), it is not surprising that they are not planning to quit their studies.

Fourth, study engagement was positively associated with academic performance, possibly due to the same reasons mentioned for the intention to quit one's studies. However, we found no relation between overcommitment to one's studies and academic performance. This disagrees with previous findings among employees that showed that excessive and obsessive–compulsive work behavior is negatively related to subjective performance (Shimazu & Schaufeli, 2009). It is possible that these individuals underrated their performance due to their low self-esteem (Jussim, Coleman, & Nassau, 1987).

Lastly, overcommitment to one's studies and study engagement mediated the relations between BIS- and BAS-activation on the one hand and exhaustion, intention to quit one's studies, and academic performance on the other hand. Specifically, a highly activated BIS was associated with negative outcomes through overcommitment, whereas a highly activated BAS was related to positive outcomes through engagement.

4.1. Study limitations

Three main limitations of this study are the following. First, the data were collected using self-reports, meaning that the relations between our study variables may have been overestimated due to common method bias. However, the magnitude of the correlations in Table 2 varies considerably, indicating that the relations among the study variables have not been biased by a common underlying process.

Second, this study started from Gray's original RST and Carver and White's corresponding BIS/BAS-scales, rather than the revised RST. Following Heym et al. (2008), we examined whether the BIS-scale could be separated into two subscales that tapped the BIS and FSSS concepts needed for testing the revised version of the RST. However, comparison of a one-factor model and a two-factor model did not convincingly support the latter. Furthermore, both subscales related in a similar way to the other study concepts. In addition, even by separating the BIS-scale only a restricted range of behavior would have been covered (Heym et al., 2008). Our findings suggest that research building on the revised RST should employ measures that are devised for testing the revised RST, rather than imperfect proxies thereof (cf. Smillie et al., 2006).

Lastly, due to its cross-sectional design, the present study cannot demonstrate causal relations. However, since RST focuses on the biological underpinnings of personality, it seems plausible that BIS- and BAS-activation affects study behavior rather than vice versa. Similarly, it appears reasonable to expect that overcommitment to one's studies and study engagement affect intention to quit, rather than the reverse: students are unlikely to invest heavily in their studies if they already intend to quit.

4.2. Study strengths and implications

The present study has several strengths and implications. First, it provides insight into the biological underpinnings of overcommitment to one's studies and study engagement. As a result, we may better understand why overcommitted and engaged students study hard.

Furthermore, overcommitment to one's studies and study engagement were differentially related to the study outcomes, suggesting that they are two different forms of heavy study investment. Therefore, teachers should be vigilant: High commitment to one's studies and high study engagement are fine, but *over*commitment should be discouraged.

Lastly, our study introduced a brief scale tapping overcommitment to one's studies, which can be used in future research on excessive study behavior. For example, it would be interesting to examine whether overcommitted and engaged students persist in

their respective effort expenditures when they enter the labor market. Our findings suggest that stable traits are partly responsible for differences in study behavior. Since study activities are psychologically similar to work activities, we expect that study overcommitment and engagement will "spill over" into the work domain. If confirmed, such findings would further underline the important role of the behavioral inhibition and approach system in everyday life.

References

Arbuckle, J. L. (2007). *AMOS 16.0 (Computer Software)*. Chicago: SPSS Inc..

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology, 67*, 319–333.

Corr, P. J. (2004). Reinforcement sensitivity theory and personality. *Neuroscience and Biobehavioral Reviews, 28*, 317–332.

Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 72*, 218–232.

Elliot, A. J., McGregor, H. A., & Gable, S. (1999). Achievement goals, study strategies, and exam performance: A mediational analysis. *Journal of Educational Psychology, 91*, 549–563.

Erez, A., & Judge, T. A. (2001). Relationship of core self-evaluations to goal setting, motivation, and performance. *Journal of Applied Psychology, 86*, 1270–1279.

Franken, I. H. A., Muris, P., & Rassin, E. (2005). Psychometric properties of the Dutch BIS/BAS scales. *Journal of Psychopathology and Behavioral Assessment, 27*, 25–30.

Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior, 26*, 331–362.

Gray, J. A. (1987). Perspectives on anxiety and impulsivity: A commentary. *Journal of Research in Personality, 21*, 493–509.

Gray, J. A., & McNaughton, N. (2000). *The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system* (2nd ed.). Oxford: Oxford University Press.

Heimpel, S. A., Elliot, A. J., & Wood, J. V. (2006). Basic personality dispositions, self-esteem, and personal goals: An approach-avoidance analysis. *Journal of Personality, 74*, 1293–1320.

Heym, N., Ferguson, E., & Lawrence, C. (2008). An evaluation of the relationship between Gray's revised RST and Eysenck's PEN: Distinguishing BIS and FFFS in Carver and White's BIS/BAS scales. *Personality and Individual Differences, 45*, 709–715.

Jussim, L., Coleman, L., & Nassau, S. (1987). The influence of self-esteem on perceptions of performance and feedback. *Social Psychology Quarterly, 50*, 95–99.

Keiser, H. N., & Ross, S. R. (2011). Carver and Whites' BIS/FFFS/BAS scales and domains and facets of the Five Factor Model of personality. *Personality and Individual Differences, 51*, 39–44.

Killinger, B. (2006). The workaholic breakdown syndrome. In R. J. Burke (Ed.), *Research companion to working time and work addiction* (pp. 61–88). Cheltenham, UK: Edward Elgar.

McNaughton, N., & Corr, P. J. (2004). A two-dimensional neuropsychology of defense: Fear/anxiety and defensive distance. *Neuroscience and Biobehavioral Reviews, 28*, 285–305.

Meijman, T. F., & Mulder, G. (1998). Psychological aspects of workload. In P. J. D. Drenth, H. Thierry, & C. J. De Wolff (Eds.), *Handbook of work and organizational psychology* (2nd ed., pp. 5–28). East Sussex: Psychology Press.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*, 879–891.

Salanova, M., Schaufeli, W., Martínez, I., & Bresó, E. (2010). How obstacles and facilitators predict academic performance: The mediating role of study burnout and engagement. *Anxiety, Stress & Coping, 23*, 53–70.

Schaufeli, W. B., Bakker, A. B., & Salanova, M. (2006). The measurement of work engagement with a short questionnaire. *Educational and Psychological Measurement, 66*, 701–716.

Schaufeli, W. B., & Van Dierendonck, D. (2000). *UBOS: Utrechtse Burnout Schaal [test manual]*. Lisse, The Netherlands: Swets & Zeitlinger.

Schaufeli, W. B., Martínez, I. M., Marques-Pinto, A., Salanova, M., & Bakker, A. B. (2002). Burnout and engagement in university students: A cross-national study. *Journal of Cross-Cultural Psychology, 33*, 464–481.

Schaufeli, W. B., Shimazu, A., & Taris, T. W. (2009). Being driven to work excessively hard: The evaluation of a two-factor measure of workaholism in the Netherlands and Japan. *Cross-Cultural Research, 43*, 320–348.

Schaufeli, W., Taris, T., Le Blanc, P., Peeters, M., Bakker, A., & De Jonge, J. (2001). Maakt arbeid gezond? Op zoek naar de bevlogen werknemer [Can work produce health? The quest for the engaged worker]. *De Psycholoog, 36*, 422–428.

Schaufeli, W. B., Taris, T. W., & Van Rhenen, W. (2008). Workaholism, burnout, and work engagement: Three of a kind or three different kinds of employee well-being? *Applied Psychology: An International Review, 57*, 173–203.

Scott, K. S., Moore, K. S., & Miceli, M. P. (1997). An exploration of the meaning and consequences of workaholism. *Human Relations, 50*, 287–314.

Shimazu, A., & Schaufeli, W. B. (2009). Is workaholism good or bad for employee well-being? The distinctiveness of workaholism and work engagement among Japanese employees. *Industrial Health, 47*, 495–502.

Smillie, L. D., Pickering, A. D., & Jackson, C. J. (2006). The new reinforcement sensitivity theory: Implications for personality measurement. *Personality and Social Psychology Review, 10*, 320–335.

Van Beek, I., Hu, Q., Schaufeli, W. B., Taris, T. W., & Schreurs, B. H. J. (2012). For fun, love or money: What drives workaholic, engaged and burned-out employees at work? *Applied Psychology: An International Review, 61*, 30–55.

Van der Linden, D., Beckers, D. G. J., & Taris, T. W. (2007). Reinforcement sensitivity theory at work: Punishment sensitivity as a dispositional source of job-related stress. *European Journal of Psychology, 21*, 889–909.

Van Veldhoven, M., & Meijman, T. F. (1994). *Het meten van psychosociale arbeidsbelasting met een vragenlijst: De Vragenlijst Beleving en Beoordeling van de Arbeid*. Amsterdam: NIA.

Wolters, C. A. (2004). Advancing achievement goal theory: Using goal structures and goal orientations to predict students' motivation, cognition, and achievement. *Journal of Educational Psychology, 96*, 236–250.

Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2007). The role of personal resources in the job demands-resources model. *International Journal of Stress Management, 14*, 121–141.