

Interrelations between motivational regulation, procrastination and college dropout intentions

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Abstract Procrastination can theoretically be conceived of as a motivational self-regulatory failure and is assumed to be a risk factor of college dropout in the higher education context. It was hypothesized that students' procrastination and college dropout intentions are closely related with their motivational regulation—in terms of the effectiveness of their efforts to self-regulate their motivation and in terms of the strategic knowledge behind the actual regulation attempts (conditional knowledge about the suitability of different motivational regulation strategies in different motivational problem situations). Data from 515 college students, who participated in an online study and stem from a variety of fields of study (58% female; average age of 23.2 years), was analyzed to test the hypothesized relationships. Structural equation modeling indicated that conditional motivational regulation strategy knowledge was positively linked to the effectiveness of motivational regulation, which in turn was negatively linked to academic procrastination and college dropout intentions. Subsequently, academic procrastination was positively related with college dropout intentions. A total negative indirect effect of conditional strategy knowledge on college dropout intentions was mediated by effectiveness of regulation and academic procrastination. The results are in line with the assumption that good competences to regulate one's own motivation are an important protection factor against academic procrastination and college dropout.

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Zusammenhänge zwischen Motivationsregulation, Prokrastination und Studienabbruchsintentionen

Zusammenfassung Prokrastination kann theoretisch als eine misslingende Selbstregulation im motivationalen Sinne aufgefasst und als Risikofaktor für Studienabbruch angesehen werden. Es wurde die Hypothese formuliert, dass Prokrastination im akademischen Kontext und Intentionen zum Studienabbruch eng im Zusammenhang mit Prozessen der Motivationsregulation stehen — im Sinne der Effektivität der Regulationsbemühungen als auch im Sinne des zugrundeliegenden Strategiewissens (konditionales Wissen hinsichtlich der Passung von unterschiedlichen Motivationsregulationsstrategien für verschiedene motivationale Problemsituationen). Analysiert wurde eine Stichprobe von 515 Studierenden (58 % weiblich, Durchschnittsalter 23,2 Jahre), die an einer Online-Studie teilnahmen. Die Schätzung eines Strukturgleichungsmodells erbrachte, dass konditionales Motivationsregulationsstrategiewissen in positiver Weise mit der Effektivität der Motivationsregulation zusammenhing, die wiederum negativ mit akademischer Prokrastination und intendiertem Studienabbruch korrelierte. Ein negativer indirekter Effekt des konditionalen Strategiewissens auf Intentionen zum Studienabbruch wurde durch die Effektivität der Motivationsregulation und akademische Prokrastination mediiert. Die Ergebnisse stehen im Einklang mit der Annahme, dass gute Kompetenzen zur Selbstregulation der Motivation ein wichtiger Schutzfaktor gegenüber akademischer Prokrastination und Studienabbruch sind.

1 Introduction

Procrastination, conceptualized as an irrational but voluntary delay of tasks despite the expectation that the delay will be associated with disadvantages, is a widespread phenomenon (Steel 2007, p. 66; see also Grunschel et al. 2013). It is problematic in many ways and has several negative consequences (for an overview, see Steel 2007). Procrastination can occur in all possible areas of life, but seems to be especially prevalent in the academic context (cf., Day et al. 2000). In particular, the higher education context is typically characterized by complex and concurrent achievement tasks, great autonomy with respect to learning organization, learning materials, specific learning goals, and learning procedures, as well as rather few opportunities to benefit from external feedback (see Dresel et al. 2015). If students are unable to handle the freedoms and delay their work assignments (especially when there are more pleasant alternatives than learning) successful studying—in terms of high performance and retention—is endangered (cf., Grunschel et al. 2013; Respondek et al. 2017; Zajacova et al. 2005). Hence, it can be presumed that procrastination can eventually lead to college dropout, although there has been little empirical evidence until now.

On the other hand, it can be theoretically assumed that procrastination in the academic context is a direct consequence of an absent or ineffective self-regulation of one's own learning motivation (referred to as motivational regulation; Engelschalk et al. 2015; Schwinger et al. 2007; Wolters 1999, 2003). Presumably, students may reduce or prevent procrastination by utilizing a motivational regulation strategy to increase and maintain their motivation. Empirical evidence regarding this relation is scarce—to the best of our knowledge, only two contributions exist on this topic, which linked the use of specific motivational regulation strategies to academic procrastination (Grunschel et al. 2016; Wolters and Benzoni 2013). Although their results were generally in line with the assumed negative relation between motivational regulation and procrastination, a series of research questions remain open. These refer particularly (a) to the competences behind the concrete use of a motivational strategy that inhibit an irrational delay of academic tasks in a given situation, (b) to the general effectiveness of motivational regulation beyond the use of specific strategies and its relations to procrastination as well as (c) to the relevance of motivational regulation and academic procrastination for students' college dropout intentions.

To provide evidence regarding these research questions, we present results from an online study with undergraduates, which allow for innovative insights into the links between motivational regulation, academic procrastination and dropout intentions. These concepts were considered together for the first time and motivational regulation was addressed in a differentiated way, incorporating conditional motivational regulation strategy knowledge (as an important aspect of students' motivational regulation competences) and the general effectiveness of motivational regulation.

2 Theoretical background

2.1 Procrastination in the academic context

Theoretical considerations from previous literature have emphasized that procrastination can be described as “the lack or absence of self-regulated performance” (Tuckman 1991, p. 474). In support of this notion, procrastination can be seen as a self-regulatory failure as it is related to less use of cognitive and metacognitive strategies as well as to greater disorganization (Howell and Watson 2007). This self-regulatory failure in procrastination can be attributable to a disposition (to generally delay things; cf., Tuckman 1991; Schouwenburg and Groenewoud 2001) as well as to a process (people procrastinate differently in different situations; Van Eerde 2000). Whether procrastination is considered from a trait or a state perspective, common aspects include the postponing of implementing an action (e. g., Van Eerde 2000), and the resulting negative consequences (e. g., Solomon and Rothblum 1984). Among the most important consequences of procrastination are negative effects on emotional well-being, health and performance (for an overview, see Grunschel et al. 2016). These negative effects are suspected to encourage college dropout intentions (e. g., Patrzek et al. 2012).

In his meta-analytical review, Steel (2007) identified, among others, task aversiveness ($r=0.40$), self-efficacy ($r=-0.38$) as well as achievement motivation ($r=-0.35$) as strong predictors of procrastination. Specifically, and integrated in an expectancy-value view on motivation, previous work demonstrated that procrastination is negatively related to self-efficacy and subjective task value (Wolters 2003). Self-efficacy, in particular, is strongly related to procrastination (Klassen et al. 2010). On the “value-side” of motivation, it was demonstrated that intrinsic (autonomous) forms of motivation prevent procrastination while extrinsic (controlled) forms of motivation increase the risk for procrastination (Orpen 1998; cf., Ryan and Deci 2000). The importance of these motivational preconditions of effective learning underpins the assumption that the dynamics of failing in self-regulating a low motivation—in terms of a low success expectancy and/or a low task value—lies at the heart of the procrastination phenomenon.

In contrast to the relative importance of motivational components, personality traits such as neuroticism, openness to experience, sensation seeking, extraversion and also intelligence were only weakly associated with procrastination ($|r|=0.03-0.24$) in the meta-analytical review of Steel (2007). Two exceptions on the personality trait level were conscientiousness and impulsiveness, which correlated, on average, to a relatively strong degree with procrastination ($r=-0.62$ and $r=0.41$, respectively). These traits are, however, conceptually strongly related with the processual regulation and shielding of one’s own motivation in the course of an (learning) action which promise higher rewards in the long run—in rivalry with more pleasant, but less important activities that promise short-term benefits (Van Eerde 2000).

Intervention studies which demonstrated that procrastination can be reduced through targeted motivational training (Tuckman and Kennedy 2009) additionally stress the relevance of motivational aspects and lead to the conclusion that a focus on salient motivators can reduce procrastination besides personality factors (Brownlow and Reasinger 2000).

2.2 Motivational regulation as a direct antecedent of procrastination

Motivational regulation is the conscious control over one’s own motivation in order to maintain or increase it (e. g., Schwinger et al. 2009; Wolters 2003). In terms of broader models of self-regulated learning, motivation can be conceived of as an internal resource—respectively, motivational regulation can be conceived of as resource management (cf., Boekaerts 1999). Central in the theoretical conceptualization are motivational regulation strategies with which the control of different components of one’s own motivation can be achieved—which, in turn, function as predictors of procrastination behaviors. In the literature, different taxonomies of regulation strategies have been proposed (e. g., Engelschalk et al. 2015; Schwinger et al. 2007; Wolters 1999). Important examples are self-consequating, proximal goal setting, the enhancement of personal significance, and ability-focus self-talk. It is important to note that motivational regulation has to be conceptualized in a situation-specific manner. Engelschalk et al. (2015) could show that, for the effective regulation of one’s motivation, it strongly matters if learning activities are appraised as too diffi-

cult (i.e., learners' success expectancy is low) or are seen as tedious and irrelevant (i.e., learners' subjective task value is low). Moreover, these authors found that it matters for the effectiveness of motivational regulation, if an initial motivation to initiate a learning activity should be established or the motivation while learning should be maintained. Consequently, different strategies are suitable to different degrees when it comes to overcoming different motivational problems (for instance, if a student worries about their capability to pass an upcoming exam while preparing for it, the enhancement of situational interest or personal significance would clearly be less suitable than dividing the learning task into a series of proximal goals or a self-talk in which the student remembers their formerly passed tests).

Previous studies have focused on the identification of motivational regulation strategies (e.g., Schwinger et al. 2012) and the positive impact of their use, especially on effort and academic performance (e.g., Schwinger et al. 2009). However, with regard to the interrelations between motivational regulation and academic procrastination, which are the focus of the present work, only limited empirical evidence exists. To the best of our knowledge, only two contributions addressing this question exist in the literature. Wolters and Bizon (2013) analyzed relations between the self-reported use of six concrete motivational regulation strategies (e.g., self-consequating, regulation of situational interest) and procrastination within a sample of 215 college students. They found correlations of varying size in the range between $r = -0.11$ and $r = -0.30$, indicating that more frequent use of motivational regulation strategies is generally linked with lower levels of procrastination and that different strategies are seemingly differentially helpful to reduce delaying behavior. Grunschel et al. (2016) reported similar results from two studies with 419 and 229 university students, respectively—the self-reported use of concrete motivational regulation strategies correlated negatively with procrastination (between $r = -0.11$ and $r = -0.34$) to small to moderate degrees. Again, differences between different strategies were evident (performance-avoidance self-talk, a strategy that can be seen as more dysfunctional in many cases, was not or even positively correlated with procrastination). Grunschel and colleagues also provided evidence that the effects of the use of these strategies on academic performance and well-being were, at least partially, mediated through students' procrastination.

These findings are in line with the assumption that procrastination is the consequence of a failure in motivational regulation (Wolters 1999). However, nothing is known regarding the competences behind the use of concrete motivational strategies that effectively inhibit an irrational delay of academic tasks in a given situation. Considering the situation-specificity of motivational regulation, it is reasonable to assume that different strategies are of varying value to overcome a specific motivational problem. It seems important that students know which strategy they should apply in which situation so that they can reach their goals and use these strategies in an effective way (Leutner et al. 2001). Conditional knowledge regarding the situation-specific suitability of different strategies seems to be a central aspect of students' motivational regulation competences (Dresel et al. 2015; cf., Paris et al. 1983). Indeed, it is apparent that students differ in their competences to regulate their motivation: Some seem to maintain or even increase their motivation for a subject despite distracting alternatives, while others give in to the alternative.

The knowledge about the suitability of different motivational regulation strategies, which may or may not be used in a specific motivational problem situation, must theoretically be separated from the actual effectiveness of the regulation endeavors in the specific situation (Engelschalk et al. 2015). The former can be seen as a necessary but not sufficient condition of the latter. This distinction mirrors the competence-performance distinction in the literature on cognitive competences (cf., Blömeke et al. 2015). In the present work, we consider motivational regulation competences in terms of conditional knowledge regarding the situational suitability of motivational regulation strategies, on the one hand, and the general regulatory effectiveness in terms of overcoming motivational problems on the other hand. Both aspects of motivational regulation are conceptualized as strongly embedded in specific motivational problem situations and are analyzed as potential antecedents of procrastination and college dropout intentions.

2.3 College dropout intentions as a consequence of unfavorable motivation and procrastination

College dropout is a multicausal, procedural event (Blüthmann et al. 2008) as it is affected by various individual, institutional and societal factors (Heublein and Wolters 2011).

According to Mashburn (2000), the formation of withdrawal cognitions and dropout intentions is an important stepping stone in the process of college student dropout and a precursor of actual dropout. He also provided evidence that dropout intentions mediate the effect of student dissatisfaction and actual dropout. Moreover, actual dropout could be predicted in this study with $\beta=0.47$ very well by dropout intentions—indicating that dropout intentions represent a preliminary stage of an actual dropout and their analysis is justified to generate valid conclusions regarding college dropout (cf. Bean and Metzner 1985).

College dropout cannot generally be seen as a loss of resources and may be functional in some constellations (Pascarella and Terenzini 1980). Nevertheless, it is often accompanied by various negative consequences for the individual, as well as society (Sarletti and Müller 2011). Several studies have been conducted on the determinants of college dropout. Overall, in the foreground of these studies were different individual reasons, such as study behaviours, physical and psychological resources, lacking motivation and low performance (Allen 1999; Arendt 2013; Heublein et al. 2003, 2010; Stage 1989). Motivation—in terms of expectancy and value—and its change over the course of study seems to be a strong predictor of dropout (e. g., Dresel and Grassinger 2013). Furthermore, it was shown that students with low engagement or reduced effort in school were more likely to drop out from high school (Archambault et al. 2009). Thus, both expectancy of being able to study successfully and value of the study are of great importance regarding dropout. Of particular relevance to the present context are studies showing that high academic self-efficacy and subjective task value can reduce academic procrastination as well as college dropout intentions (DeWitz et al. 2009; Wu and Fan 2017). A qualitative interview study of Patrzek et al. (2012) with university counselors indicated that college dropout, as a consequence of academic procrastination, is not uncommon.

Against the background of these findings and the role of procrastination as a potential mediator between motivational aspects and college dropout, it seems fruitful and of great relevance to especially study the associations of procrastination with college dropout intentions and how both of them are interrelated with motivational regulation. However, until now, the empirical evidence regarding these processes has been very limited—in particular, no studies have analyzed the links between motivational regulation and college dropout.

2.4 Research questions and hypotheses

As mentioned above, previous studies have not integrated procrastination, college dropout and motivational regulation. Additionally, there is generally little research on the competence or knowledge students need to effectively regulate their learning motivation in the face of motivational problem situations (cf. Dresel et al. 2015). To mitigate these research deficits, the present study aims to examine the interdependencies between motivational regulation—in terms of underlying conditional strategy knowledge as well as the actual effectiveness of regulation—, academic procrastination and college dropout intentions. Fig. 1 depicts the hypothesized interrelations.

First, it was expected that conditional motivational regulation strategy knowledge (as an important facet of motivational regulation competence) would be positively related to the general effectiveness of motivational regulation (Hypothesis 1). In line with assumptions made by Engelschalk et al. (2015), conditional knowledge about which strategy should be used in which motivationally critical context enables a person to adequately use motivational regulation strategies and, thus, has a great impact on how effective a person regulates one's own motivation.

In turn, we hypothesize that the general effectiveness of motivational regulation is strongly negative related to academic procrastination (Hypothesis 2). This is justified by the theoretical notion that academic procrastination is essentially a failure in self-regulating one's own motivation. In contrast to the small to moderate correlations found for the use of specific strategies (Grunschel et al. 2016; Wolters and Benzon 2013), the more global, outcome-oriented and strategy-independent regulatory effectiveness should be more closely related to academic procrastination. Corresponding with this assumption, we also expected that the effect of conditional motivational regulation strategy knowledge on academic procrastination is fully mediated through the effectiveness of motivational regulation.

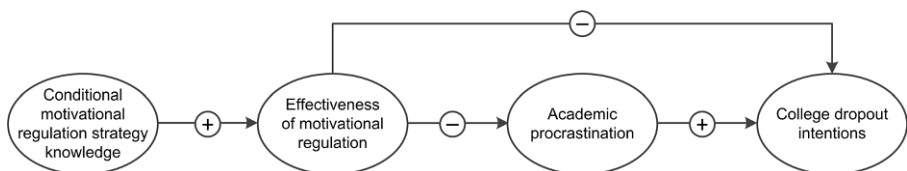


Fig. 1 Hypothesized model

Subsequently, we hypothesize that academic procrastination positively relates to college dropout intentions (Hypothesis 3) due to its widely negative effects, particularly on learning behavior, performance, and emotional well-being (for an overview, see Grunschel et al. 2016), which in turn raise the probability of college dropout (e. g., Heublein 2014).

On that basis, we also expected that conditional strategy knowledge and the general effectiveness of motivational regulation would negatively relate to college dropout intentions (Hypothesis 4). Although there are no studies connecting motivational regulation in a narrower sense with dropout intentions, this is justified by the important role that a lack of motivation plays for college dropout (e. g., Dresel and Grassinger 2013). Here, it was expected that motivational regulation would predict dropout intentions at least partially mediated by academic procrastination. Other ways in which motivational regulation may additionally affect dropout may be reasonable—for example, in terms of general well-being, which can be independent of actual learning behaviors.

3 Method

3.1 Procedure and participants

To answer the research questions, data from a larger study with two measurement occasions with online questionnaires and tests were utilized. Specifically, we used cross-sectional data from the second measurement occasion (scheduled in the middle of the winter term 2017/2018), in which the variables that are central with regard to the present research questions—i. e., motivational regulation, academic procrastination and college dropout intention—were assessed.

Participants of the study were university students enrolled at a university in southern Germany. For the second measurement occasion, all 1005 students who participated in the first measurement occasion and agreed to being addressed, were contacted by e-mail. Participants could receive a voucher for electronic commerce companies in the amount of 10 Euros for participation in the second measurement occasion. 728 students responded to the e-mail call. We included those who answered the online questionnaire completely without unreasonably short duration times in the present analyses.¹

¹ Participation in the second measurement occasion was widely independent of students' responses in the first measurement occasion, which was scheduled four months earlier at the end of summer term 2017. Only the semester in which the students were enrolled in their courses of study correlated slightly negative ($r = -0.10$; $p < 0.001$) with participating in the second measurement occasion—indicating that students in later semesters were somewhat less likely to participate (probably because some of them graduated meanwhile). Other variables assessed at the first measurement occasion—especially, students' prior and actual performances, several aspects of their achievement motivation, their personality in terms of the big five factors and also their dropout intentions at the time—were not related to students' participation in the second measurement occasion. Consequently, it seems well justified to assume that the results are not biased by sample dropout from the first to the second measurement occasion.

The final sample in our analysis consisted of 515 undergraduate students with an average age of 23.2 years ($SD=3.5$). 58% of the participants were female. The students derived from different faculties and were enrolled in different semesters. Frequent fields were economics and law (26%), teaching (20%), mathematics and natural sciences (18%), as well as social sciences (16%). On average, the students were in their 5.7th semester in their course of studies ($SD=2.5$); most of them were enrolled in their 3rd semester (30%), followed by the 5th semester (26%).

3.2 Measurements

Descriptive statistics and internal consistencies (Cronbach's α) can be found in Table 1. Item non-response did not arise since participants were asked for complete responses by the online survey tool at the end of each questionnaire page when they skipped one or more items.

3.2.1 Conditional motivational regulation strategy knowledge

As a central aspect of students' competences to regulate their own motivation, we assessed conditional motivational regulation strategy knowledge with a situational judgment test (Steuer et al. 2016). Such a testing approach is suitable not only to assess facets of the competence behind actual regulation behaviors, but also to overcome methodical limitations of self-reports of these behaviors (see, e.g., Maag Merki et al. 2013). The instrument measures conditional knowledge regarding the situation-specific fit of different motivational regulation strategies in specific motivational problem situations with five standardized situational vignettes.

The vignettes present motivational problem situations that consisted of a combination of three regulation cues. The first cue refers to the motivational quality of the problem, which can in this regard either be a task value problem (task is perceived as too boring or subjectively unimportant) or an expectancy problem (task is too difficult or own abilities are perceived as too low; cf., Engelschalk et al. 2017). The second cue refers to the phase in the course of action in which low motivation occurs (motivation to initiate a learning activity is low vs. motivation to maintain a learning activity is low). Finally, as the third cue, the type of demands on which the learning is directed to was varied—as common demands of studying for an exam and writing

Table 1 Descriptive statistics, internal consistencies and latent correlations

	<i>M</i>	<i>SD</i>	α	Range		Latent correlations			
				Potential	Actual	1	2	3	4
1. Conditional motivational regulation strategy knowledge	1.67	1.10	0.92	-5-5	-1.8-4.6	-	-	-	-
2. Effectiveness of motivational regulation	4.03	0.93	0.92	1-6	1.0-6.0	0.36	-	-	-
3. Academic procrastination	2.71	0.99	0.94	1-5	1.0-5.0	-0.33	-0.64	-	-
4. College dropout intention	1.87	0.96	0.90	1-6	1.0-6.0	-0.23	-0.45	0.42	-

N=515. Latent correlations were estimated using a measurement model and were all significant at $p<0.001$

an academic paper were used (Dresel et al. 2015; Steuer et al. 2015). One example vignette reads as follows: “You are faced with the task of writing a term paper. Therefore, you have to independently search for literature and write an academic text for a specific deadline. The contents you have to work with are boring (e.g., uninteresting, scarcely useful, not important). This is why you are not motivated to begin”. The vignettes were presented in a randomized order.

After each vignette, the students were confronted with various strategies, which were derived from proven taxonomies (Engelschalk et al. 2015; Schwinger et al. 2007; Wolters 1999) and are classified—by means of expert ratings as described by Steuer et al. (2016)—as functional (suitable to solve the motivational problem at hand), dysfunctional (not suitable) or ambivalent (neither suitable nor not suitable). Students were asked to rate the suitability of the strategies to overcome the specific motivational problem posed by the vignette at hand on Likert-type scales ranging from 1 (*not suitable at all*) to 6 (*completely suitable*). The assessment of students’ strategy knowledge is based exclusively on functional and dysfunctional strategies—nevertheless, ambivalent strategies are also presented in the situational judgement test to ensure differentiated ratings and an adequate difficulty (which may be reduced when only clearly functional or clearly dysfunctional strategies are presented). In order to quantify students’ conditional motivational regulation strategy knowledge, their suitability ratings for functional strategies were compared with those for dysfunctional strategies within each vignette using pair comparison scores (see Händel et al. 2013; for an overview of tests using such scores). A comparison (i.e., difference) score for a given pair of strategies is higher the more suitable a student rates the respective functional strategy and the less suitable he or she rates the respective dysfunctional strategy. Overall, 22 pair comparison scores were calculated which were averaged into a single indicator, representing students’ conditional motivational regulation strategy knowledge.

3.2.2 *Effectiveness of motivational regulation*

Effectiveness of motivational regulation was measured situational-specifically as well, using the identical motivational problem vignettes as described above. With regard to each of the five vignettes, the following two items drawn from Engelschalk et al. (2017) were presented: “In this situation I am able to motivate myself”, “In this situation I am able to control my motivational problem”. The students rated these items on Likert-type scales ranging from 1 (*disagree completely*) to 6 (*agree completely*).

3.2.3 *Academic procrastination*

For measuring academic procrastination, we used 10 items of the German translation of the Tuckman Procrastination Scale, adopted to the academic context (TPS, Stöber and Joormann 2001; cf., Tuckman 1991). An example item reads: “I needlessly delay finishing jobs in my studies, even when they’re important”. Participants’ responses to the items were assessed with Likert-type scales ranging from 1 (*not correct at all*) to 5 (*fully correct*).

3.2.4 College dropout intentions

As a direct strongly predictive precursor of actual dropout (Mashburn 2000), we assessed college dropout intentions using four items by Bülke and Dresel (2018). Lehmann (2007) pointed to the fact, that cognitions and feelings of not fitting in at university precede the final dropout decision. Accordingly, we used items representing the first stage of dropout intentions, namely perceiving a misfit between the course of study and oneself (e. g., “Currently, I don’t feel suitable for studying”). The Likert-type response scales ranged from 1 (*disagree completely*) to 6 (*agree completely*).

3.3 Analyses

We tested our hypothesis using structural equation modeling (SEM). Thus, all constructs were considered on a latent level. All variables were parceled according to the Item-to-construct balance approach (Little et al. 2002). Due to the skewed distributions of students’ dropout intentions we treated them as ordered categorical variables and applied the Means and Variance Adjusted Weighted Least Squares Estimator (WLSMV). We modeled the relationships between conditional motivational regulation strategy knowledge, regulatory effectiveness, academic procrastination and college dropout intentions in a preliminary measurement model as latent correlations and in a structural equation model as regression paths, additionally specifying indirect effects to test the respective mediation hypotheses. The models were estimated with Mplus 7 by Muthén and Muthén (2012).

4 Results

4.1 Descriptive statistics and latent correlations

As descriptive statistics indicate, academic procrastination and college dropout intentions were, on average, at a relatively low level (see Table 1). Nevertheless, these two constructs still show considerable interindividual differences as indicated by relatively large variances and ranges. Students’ conditional knowledge about suitable motivational regulation strategies and their general effectiveness in regulating motivational problems were, on average, slightly positively pronounced.

The estimated measurement model demonstrated a very good fit to the data ($\chi^2 = 18.2$; $df = 14$; $p = 0.20$; RMSEA = 0.02; CFI = 1.00; TLI = 1.00). The latent variables fulfilled Stevens’ (2009) criterion that standardized factor loadings should be higher than 0.40, as the loadings ranged from around 0.90 to 0.99. In general, correlations of medium size were observed between all constructs (see Table 1). Their range indicates substantial relationships between the variables in the focus of the present work. A relatively strong correlation was observed between regulatory effectiveness and academic procrastination, indicating that students who report that

they are able to motivate themselves in specific motivational problem situations are less likely to suffer from irrational and detrimental delaying academic tasks.²

4.2 Structural equation modelling

Estimates for the hypothesized structural equation model are displayed in Fig. 2. This model showed very good fit indices ($\chi^2 = 27.6$; $df = 16$; $p < 0.05$; RMSEA = 0.04; CFI = 1.00; TLI = 0.99).

As expected, conditional knowledge regarding the situation-specific suitability of motivational regulation strategies was positively linked to the general effectiveness of motivational regulation (Hypothesis 1). This indicates that the better this aspect of students' motivational regulation competence is, the more they indeed regulate their motivation in an effective way.

In line with Hypothesis 2, regulatory effectiveness was strongly negatively linked to academic procrastination—meaning that the more students regulate their motivation effectively in general, the less pronounced their academic procrastination.

Subsequently, academic procrastination was—as expected in Hypothesis 3—positively linked to college dropout intentions to a small to moderate degree, indicating that students who procrastinate carry a higher risk for developing college dropout intentions. Remarkably, dropout intentions were also directly interrelated with regulatory effectiveness, suggesting a potential protective effect of motivational regulation against dropout intentions above and beyond procrastination behavior.

Indirect effects, which were estimated to test the mediational Hypothesis 4, confirmed all assumed mediation effects. First, an indirect effect of conditional motivational regulation strategy knowledge on academic procrastination was observed,

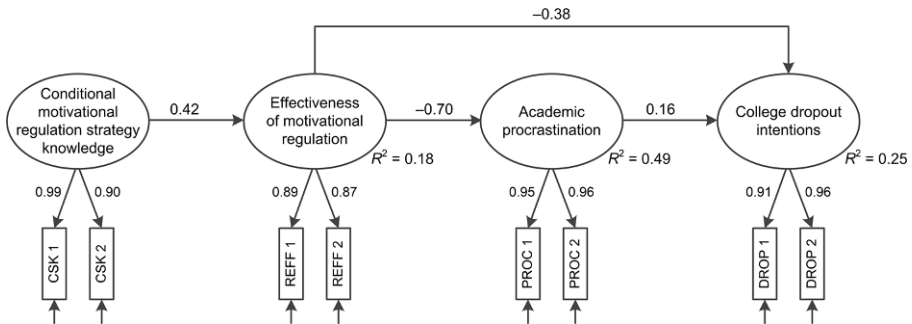


Fig. 2 Structural equation modeling of the effects of motivational regulation (in terms of respective conditional strategy knowledge and the effectiveness of this regulation) on academic procrastination and college dropout intentions (all paths: $p < 0.05$)

² Nonetheless, the correlation of $\rho = -0.64$, which corresponds to 41% shared variance between the two constructs, was small enough to justify separate constructs. This was also supported by an additional confirmatory factor analysis, which revealed a significantly better fit to the data for a two-factor solution in which the items of the two constructs loaded on separate factors than for a one-factor solution with all items loading on one common factor ($\Delta\chi^2 = 252.4$; $\Delta df = 1$; $p < 0.001$).

which was fully mediated by regulatory effectiveness ($\beta = -0.29$; $p < 0.001$). Second, the total effect of the effectiveness of motivational regulation on college dropout intentions ($\beta = -0.49$; $p < 0.001$) was not only due to the respective direct effect reported above, but also partially mediated by academic procrastination ($\beta = -0.11$; $p < 0.05$). Finally, a significant total effect of students' conditional knowledge regarding the situation-specific suitability of motivational regulation strategies on their dropout intentions was found ($\beta = -0.20$; $p < 0.001$), which was composed of two mediational effects—namely, (i) a mediation through both regulatory effectiveness and academic procrastination ($\beta = -0.05$; $p < 0.05$) as well as (ii) a mediation only through regulatory effectiveness, followed by its direct effect on dropout intentions ($\beta = -0.16$; $p < 0.001$).

5 Discussion

Motivational regulation is theoretically ascribed an important role in self-regulating learning and studying—as such, it can be assumed to be theoretically closely intertwined with academic procrastination, which can be understood as a motivational self-regulatory failure (cf., Steel 2007). However, surprisingly few studies exist on this relationship (Grunschel et al., 2016; Wolters and Benzon 2013). The present study aimed to expand our knowledge on the interplay of attempts to regulate one's own motivation to accomplish academic tasks and an irrational and detrimental delaying of these tasks in the higher education context. A central assumption of the present work was that both motivational regulation and procrastination are relevant factors for college dropout—a phenomenon of great importance for educational practice and society, especially in light of frequently large dropout rates (cf., Heublein 2014). Although this assumption seems theoretically sound, it had not yet been tested empirically to the best of our knowledge. We hypothesized a model in which the effect of motivational regulation competence on dropout intentions is assumed to be mediated by the actual effectiveness of motivational regulation and academic procrastination.

An important strength of the present study is that motivational regulation was considered in a differentiated manner with respect to two aspects, namely students' conditional knowledge regarding the situational fit of motivational regulation strategies as an aspect of their motivational regulation competences, as well as their actual regulatory effectiveness in terms of overcoming motivational problems. This approach to conceptualize motivational regulation that parallels the competence-performance distinction in the literature (cf., Blömeke et al. 2015) is innovative and complements work in which the extent of the use of concrete motivational regulation strategies were focused (cf., Engelschalk et al. 2017; Grunschel et al. 2016; Wolters and Benzon 2013). Other strengths involve the use of test data (to assess strategy knowledge) as well as the utilization of a relatively large and diverse sample of undergraduates, who derived from different subjects and semesters—which supports the generalizability of our results.

The hypothesized model could be confirmed to a great extent. It fitted very well to the data and all expected paths were significant. This general pattern of results is in line with the theoretical assumption that students with more conditional motivational regulation strategy knowledge also demonstrate a better general effectiveness in this type of self-regulation and, in turn, suffer to a lesser degree from academic procrastination and are less likely to have thoughts of quitting their course of studies (Engelschalk et al. 2015; Grunschel et al. 2016; Patrzek et al. 2012; Steel 2007; Wolters 1999; Wolters and Benzon 2013). All expected mediational effects in this four stage relationship could also be safeguarded, suggesting a cascading intrapsychic process that should be analysed in greater detail using more process-oriented approaches in future research (e.g., Wäschle et al. 2014).

A strong positive association could be observed between conditional motivational regulation strategy knowledge and the effectiveness of motivational regulation, indicating that personal competences behind the more behavioral self-regulation of motivation are indeed strongly linked to the actual effectiveness of motivational regulation (Hypothesis 1). This is not a trivial relationship, since motivational regulation competence can be seen as a necessary but not as a sufficient condition of actual motivation regulation endeavors and its effectivity (cf., Blömeke et al. 2015; Engelschalk et al. 2015).

An especially strong negative link could be spotted between the effectiveness of motivational regulation and academic procrastination (Hypothesis 2). This result is in line with Baumeister and Heatherton's (1996) assumption that regulatory effectiveness (here considered from a self-regulatory perspective) can prevent academic procrastination. The effect of motivational regulation on procrastination identified in the present study was notably stronger than found in previous studies (Grunschel et al. 2016; Wolters and Benzon 2013). Since these previous studies measured students' use of concrete motivational regulation strategies separately and without regard of the specific motivational problem situation (although different students may use different strategies in different situations and may nevertheless be similarly effective in coping with their motivational problems), our finding can be taken as an indication that students' efforts in regulating their own motivation and their procrastination behavior is much more closely intertwined than originally assumed. Thus, the notion that procrastination can be seen as a failure of self-regulation in motivational terms (Steel 2007; Wolters 1999) can really be supported by our results.

The associations between the aforementioned constructs and college dropout intentions (Hypothesis 3) were smaller, but nevertheless substantial and practically significant—especially when facing earlier findings that underpin that college dropout is a multicausal event (Blüthmann et al. 2008; Heublein and Wolter 2011). Notably, there were two relevant effects. First, academic procrastination was positively interrelated with college dropout intentions and partly mediated the links between them and motivational regulation. This was in line with our theoretical assumption that irrationally but voluntarily delaying academic tasks despite expecting disadvantages, which may result from motivational regulation that lacks a sufficient strategic knowledge base and, thus, is ineffective raises the dropout risk. Second, ineffective motivational regulation was also associated with higher dropout intentions, independently from procrastination behavior. Obviously, other mechanisms associated with

the management of the internal resource of motivation are important here. These might include detrimental effects on the quality of learning activities (Chemers et al. 2001), performance anxiety (Respondek et al. 2017) and emotional stability (Lounsbury et al. 2004). Altogether, a substantial total negative indirect effect of conditional motivational regulation strategy knowledge on students' college dropout intentions could be found (Hypothesis 4), which suggests that motivational regulation is linked with college dropout intentions via multiple pathways—whereby one of these pathways is academic procrastination. These findings have consequences for the theoretical understanding of college dropout and its precursors (Heublein et al. 2003).

Two main limitations of the present study should be mentioned. First, the study design was correlational and changes in the variables were not addressed. Thus, the results cannot be interpreted in a causal way. Nevertheless, the directions of the modeled effects were derived from theoretical considerations and are in line with assumptions in the literature (e. g., Grunschel et al. 2016). Future research with rigorous longitudinal designs should address the short-term and long-term development of procrastination behavior and dropout intentions in dependence of motivational regulation and the required competences. Second, effectiveness of motivational regulation, procrastination and dropout intentions were being assessed using self-reported measurements—i. e., all concepts aside from conditional motivational regulation strategy knowledge, which was assessed by means of a situational judgment test. Additionally, besides this situational judgment test, also the quantitative use of motivational regulation strategies in general should be considered in order to represent the construct of motivational regulation with all its facets (quantitative and qualitative use of motivational regulation strategies as well as their situation-specific fit). For further research, it would be desirable to replicate the findings with objective behavioral data (e. g., regarding procrastination). Moreover, actual dropout should also be considered (e. g., as reported by the examination office), which can be seen as an event that is closely interrelated with dropout intentions, but, nevertheless separated from them (Mashburn 2000). Finally, the actual use of motivational regulation strategies should be considered, as the majority of research regarding motivational regulation was focused on it. It theoretically functions as an intermediate characteristic between strategy knowledge and effectiveness of motivational regulation.

5.1 Conclusion

Overall, our results are in line with the theorized relationships between the variables of interest. Despite the limitations mentioned above, they allow for the conclusion that motivational regulation competence (in terms of conditional strategic knowledge) and, in turn, the general effectiveness of motivational regulation are closely associated with academic procrastination and dropout intentions (which can be seen as a first indication and an early stage of actual dropout; Bean and Metzner 1985; Mashburn 2000). In this way, the findings contribute to the understanding of procrastination as a failure in the self-regulation of one's own motivation (cf., Wolters 1999) and a risk factor for college dropout (cf., Patrzek et al. 2012)—they emphasize

the relevance of motivational regulation in these processes. They also could contribute to the development of prevention and intervention approaches in the context of academic procrastination and college dropout with suggesting that developing students' strategic knowledge regarding the suitability (and implementation) of regulation strategies in specific motivational problem situations may be a promising training element.

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