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The relation between task-specific motivational profiles and training of self-regulated learning skills

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ABSTRACT

Self-regulated learning (SRL) skills, such as accurate self-monitoring and regulation of restudy choices, are important but difficult skills. Previous research has demonstrated that even when students were successfully trained in self-monitoring and making study choices, large differences existed in students' ability to accurately self-regulate their learning. One of the factors that might be associated with the effectiveness of SRL-skill training is students' motivation for the specific task under study. In two studies with secondary education students it was investigated if students' task-specific motivational profiles are associated with task-specific SRL skills after training.

Furthermore, association between motivation profiles with learning outcomes, mental effort, and self-efficacy were examined. In Study 1a, latent profile analysis resulted in four motivational profiles: (1) poor quality, (2) moderately positive, (3) moderately negative, and (4) good quality. Findings further showed that students with a "good quality" motivational profile scored higher on monitoring accuracy and learning outcomes than students with "poor quality" motivational profile. In Study 1b, similar motivational profiles were obtained as in Study 1a. Results demonstrated that students with a "moderately positive" motivation profile showed higher monitoring accuracy than students with a "poor quality" motivational profile. These findings show the importance of investigating task-specific motivational profiles in relation to training self-monitoring and making study choices.

1. Introduction

Training students to become effective self-regulated learners is becoming increasingly important (i.e., lifelong learning). To be able to actively engage in one's own learning process, students need to monitor their learning process, decide whether or not the learning activity is fruitful, and determine how they can plan future learning activities accordingly (Pintrich, 2000; Winne & Hadwin, 1998; Zimmerman, 2000a, 2008). Monitoring provides information about performance on a task from the object-level or cognitive level (i.e., the learning task itself) to the meta-level (see Nelson & Narens, 1990). At the meta-level, metacognitive knowledge about the task (e.g., how difficult the task is) and the learner (e.g., ideas about one's ability in a certain domain) are stored. Information from the monitoring process can be combined with metacognitive knowledge and subsequently be used to regulate further learning (Nelson & Narens, 1990). For example, a student knows he or she is working on a difficult biology problem (i.e., metacognitive task knowledge) and notices that he or she is struggling to solve a certain step in the biology problem (i.e., object-level monitoring). To regulate further learning, the student chooses to practice the problem again which is a good choice considering the student was struggling to solve the steps and thinks the problem is difficult. This way, using information from monitoring can lead to effective regulation choices if monitoring is accurate. According to the discrepancy-reduction model of regulation, it is effective to spend more time on an item (i.e., a regulation choice) if monitoring shows that it was not well understood or learned (Nelson, Dunlosky, Graf, & Narens, 1994; Thiede, 1999; Tullis & Benjamin, 2011). Therefore, when students are able to accurately monitor their learning, they can make better regulation decisions for the remainder of the learning process, leading to more optimal learning outcomes (Thiede, Anderson, & Therriault, 2003).

Although most models of self-regulated learning (SRL) agree on the importance of monitoring (e.g., Muis, 2007; Nelson & Narens, 1990; Pintrich, 2000; Winne & Hadwin, 1998; Zimmerman, 2008), research has shown that without additional instructional support self-monitoring and regulation of study are difficult skills for students (Baars, Vink, Van Gog, De Bruin, & Paas, 2014; Baars, Visser, Van Gog, De Bruin, & Paas, 2013; De Bruin, Thiede, Camp, & Redford, 2011; Dunlosky & Lipko,

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2007). Learners tend to overestimate the quality of their own learning and if monitoring is accurate it does not always result in better regulation of study (e.g., restudy choices, Baars et al., 2013, 2014; Kostons, Van Gog, & Paas, 2012).

One reason why monitoring of one's own learning is difficult, is that it requires mental effort (e.g., Griffin, Wiley, & Thiede, 2008; Van Gog, Kester, & Paas, 2011). Mental effort is an indication of the amount of cognitive load that is invested (i.e., a subjective rating of the cognitive capacity allocated to cope with the demands imposed by a task; Paas, 1992). Working memory (WM) has a limited capacity (see Baddeley, 1986; Cowan, 2001). Therefore, when students have to combine the learning task with the dual task of monitoring and regulating one's own study this might be too demanding for one's cognitive capacity. Training students how to monitor and regulate their learning for a specific problem in combination with training of how to solve that problem, might lead to a reduction in cognitive load, and help students to monitor their learning process.

However, the study by Kostons et al. (2012) showed that even when secondary school students were successfully trained in self-monitoring and task selection, large differences in self-monitoring accuracy and learning gains were found between students. In the study, video-modeling examples were used to train self-monitoring and regulation of study when learning to solve genetics problems: Students observed computer screen recordings of a human model solving a genetics problem, providing verbal explanations while monitoring by self-assessing his/her performance and subsequently making a study choice (i.e., selecting a task to study). Although the video-modeling proved to be effective for secondary school students to learn to solve genetics problems and self-regulation skills, the large differences in students' SRL accuracy suggest that certain individual differences between students determine the effectiveness of self-regulation training. These large differences in self-regulation and learning gains, even after taking part in a successful training, have yet to be explained.

In the current study, we aim to examine whether individual differences in students' motivation for performing the task can explain some of the variance in monitoring and regulation accuracy and learning gains *after* video-modeling training of SRL skills. Task-specific motivation will likely influence students' engagement in the SRL (training) task (cf. Efklides, 2011; Kostons et al., 2012; Pintrich, 1999). Examining if individual differences in motivation would be related to the effectiveness of SRL training, will help us gain more insight into which students can be effectively trained using video modeling examples.

1.1. Motivation and SRL

Motivation and SRL are closely related constructs. Motivation is often considered as a prerequisite for using skills such as monitoring and regulation of study (Zimmerman, 2000a; Zimmerman & Schunk, 2008). Self-regulation skills, such as accurate monitoring, require a high level of engagement of students (Pintrich, 1999). However, if learners consider a task to be uninteresting or unimportant, they are unlikely to engage in this process (Pintrich, 1999, 2003; Zimmerman, 2000a). According to the Unified Model of Task-specific Motivation (UMTM) the interaction between four types of valences will cause a student to take action (i.e., cognitive, affective, positive, and negative). A student can have affective (i.e., intrinsic motives) and cognitive valences (i.e., extrinsic motives) about feeling while performing a task and the value of the consequences of doing this task. Also, these valences can be positive or negative causing a student to approach or avoid a task (de Brabander & Martens, 2014). All four valences will play a role in student behavior at the task level. Therefore, students not only need the skills to self-regulate their learning activities, but also need a certain willingness to self-regulate (see for example, Pintrich, 1999; Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009).

According to self-determination theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2000a, 2000b) there are several types of motivation that differ in the amount of autonomy that is experienced. Autonomously motivated students experience volition and psychological freedom. These students study out of individual interest or the satisfaction the task or activity brings them (i.e., intrinsic motivation) or because doing the task or activity is valuable for attaining personal goals or development (i.e., identified motivation). In contrast, students who score high on controlled motivation experience pressure. This pressure can come from within, such as to avoid feelings of shame (i.e., introjected motivation) or from an external source, such as demands from an authority figure like a teacher or parent (i.e., external motivation).

Research has demonstrated that students can have autonomous and controlled reasons for studying at the same time, such as being interested in the learning materials *and* having a desire to obtain a good grade (see Vansteenkiste et al., 2009). As can be seen in Table 1, several studies have been conducted in middle school, high school, and college settings that examined students' motivational profiles (Boiché & Stephan, 2014; Cannard, Lannegrand-Willems, Safont-Mottay, & Zimmermann, 2016; González, Paoloni, Donolo, & Rinaudo, 2012; Hayenga & Corpus, 2010; Hill, 2013; Kusurkar, Croiset, Galindo-Garré, & Ten Cate, 2013; Ratelle, Guay, Vallerand, Larose, & Senécal, 2007; Vansteenkiste et al., 2009; Wormington, Corpus, & Anderson, 2012).[1] In these studies, 3 to 5 motivational profiles were identified. Vansteenkiste et al. (2009) identified four motivational profiles in high school and college samples: a good quality (i.e., high autonomous, low controlled), poor quality (i.e., low autonomous, high controlled), low quantity (i.e., low autonomous and controlled), and high quantity motivational profile (i.e., high autonomous and controlled). Similar profiles were found for middle school students (Hayenga & Corpus, 2010), high school students (Wormington et al., 2012), and undergraduates (González et al., 2012; Kusurkar et al., 2013).

However, as can be seen in Table 1, some studies identified a moderate autonomous-moderate controlled profile as well (Boiché & Stephan, 2014; Hill, 2013; Ratelle et al., 2007) or profiles with higher scores on introjected and identified motivation relative to intrinsic and extrinsic motivation (i.e., extrinsic profile) or with especially high scores on amotivation (Cannard et al., 2016).

Importantly, studies demonstrate that motivational profiles characterized by high levels of autonomous motivation relative to controlled motivation obtain better learning and self-regulated learning outcomes. For example, the good quality group in the study by Vansteenkiste et al. (2009), obtained higher scores for cognitive processing (e.g., elaboration, critical thinking), metacognitive self-regulation (e.g., time and environment use), and achievement when compared to the other groups. Although, the study by Vansteenkiste et al. (2009) shows that motivational profiles characterized by high levels of autonomous motivation are associated with some SRL skills, it is unclear if these profiles are also associated with self-monitoring accuracy and regulation of study. As mentioned earlier, without any additional instructional support, students generally score poorly on these SRL skills (e.g., Baars et al., 2013, 2014). Although, SRL training could be effective, we assume that motivational profiles could determine to what extent SRL training is effective (Kostons et al., 2012). That is, especially students with a good quality motivational profile might benefit from SRL training. The relation between motivational profiles and training effectiveness could be explained by the effort that the learner with more autonomous motivation is willing to invest *during* the training (Paas, Tuovinen, Van Merriënboer, & Darabi, 2005). Students with motivational profiles characterized by higher levels of autonomous motivation possibly pay better attention to the modeling examples, making them more effective. When the training is effective, this might make the dual task of regulation own performance and solving the problem less cognitively demanding. We therefore expect that *after* the SRL-skill

[1] Studies conducted in physical education are excluded from this literature review.