



College Students' Time Management: a Self-Regulated Learning Perspective

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Abstract

Despite its recognized importance for academic success, much of the research investigating time management has proceeded without regard to a comprehensive theoretical model for understanding its connections to students' engagement, learning, or achievement. Our central argument is that self-regulated learning provides the rich conceptual framework necessary for understanding college students' time management and for guiding research examining its relationship to their academic success. We advance this larger purpose through four major sections. We begin by describing work supporting the significance of time management within post-secondary contexts. Next, we review the limited empirical findings linking time management and the motivational and strategic processes viewed as central to self-regulated learning. We then evaluate conceptual ties between time management and processes critical to the forethought, performance, and post-performance phases of self-regulated learning. Finally, we discuss commonalities in the antecedents and contextual determinants of self-regulated learning and time management. Throughout these sections, we identify avenues of research that would contribute to a greater understanding of time management and its fit within the framework of self-regulated learning. Together, these efforts demonstrate that time management is a significant self-regulatory process through which students actively manage when and for how long they engage in the activities deemed necessary for reaching their academic goals.

Keywords Self-regulated learning · Time management · Postsecondary students · Motivation · Strategies

Time management has been defined as “the self-controlled attempt to use time in a subjectively efficient way to achieve outcomes” (Koch and Kleinmann 2002, p. 201) and as “achieving an effective use of time while performing certain goal-directed activities”

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(Claessens et al. 2007, p. 262). Although there is no consensus on its major components, theorists typically portray time management as a multidimensional process that includes setting and prioritizing goals, short- and long-term planning, estimating time demands, monitoring how time is spent, and deliberately structuring or allocating how time is used (Aeon and Aguinis 2017; Britton and Glynn 1989; Burt et al. 2010; Macan 1994; Richards 1987; van Eerde 2015). Effective time management is reflected in a person's capability, even under shifting situational demands, to use their time efficiently and in a way that both advance their pursuit of valued goals and also avoid distractions, procrastination, or other misappropriations of time (Claessens et al. 2007; Strunk et al. 2013). Particular strategic behaviors thought to reflect good time management include using a planner, following a daily schedule, making to-do lists, keeping a time-use diary, writing reminder notes, setting personal deadlines, reducing wasted time, and organizing one's workspace in a way that reduces distractions (Bond and Feather 1988; Britton and Glynn 1989; Macan et al. 1990). In general, researchers view time management as amenable to improvement through well-designed interventions or contextual supports (Claessens et al. 2007; Zimmerman et al. 1994).

Although younger students increasingly face multiple and strong demands on their time (Hilbrecht et al. 2008; Won and Yu 2018; Shaunessy-Dedrick et al. 2015), we focus our discussion on university students because they represent an especially salient population within which to consider time management. As students transition from secondary school to university, they typically experience an increased level of autonomy and responsibility because they are required to engage in more learning activities outside of the classroom, on their own time, and under their own direction (Banahan and Mullendore 2014; Terenzini et al. 1994). Many university students no longer have daily interactions with instructors, parents, or other adults who might have previously provided structure to when, for how long, and under what conditions they engaged in academic work. As well, the learning required to be successful in college often is more challenging and time-consuming than the academic work students encountered in secondary school (Asikainen and Gijbels 2017; Zusho 2017). Many university students, furthermore, have both increased opportunities and demands for participation in non-academic pursuits (e.g., social, employment) that can be detrimental to their academic success and well-being (Fromme et al. 2008; Hicks and Heastie 2008). In fact, the need to balance the many academic, social, and extracurricular goals students pursue is a primary source of stress and a major challenge for first-year university students (Shaunessy-Dedrick et al. 2015; van der Meer et al. 2010).

Institutional support for improved time management ranks among the most common academic interventions provided to university students. Indeed, a majority of all US students at traditional four-year institutions now complete some form of first-year seminar course (U.S. Department of Education, Institute of Education Sciences, What Works Clearinghouse 2016; Young and Hopp 2014). Although the principle goals vary, working to establish or improve students' efficient management and use of their time is among the most cited goals for these courses (Truschel and Reedy 2009; Young and Hopp 2014). Time management is also a ubiquitous topic covered within for-credit study skills courses as well as optional short-term workshops (Wolters and Hoops 2015). Finally, advisors, academic coaches, counselors, and other academic support staff also identify improvement in time management as central to the assistance they provide individual students (Sanders et al. 2018). Overall, these supports for improving time management consume substantial financial resources, are intended for students regardless of their prior achievement level, and are commonly available at institutions of all types and academic calibers (U.S. Department of Education, Institute of Education Sciences,

What Works Clearinghouse 2016). In sum, the capacity to organize efficiently and to use time wisely appears to represent a salient, malleable, and potent influence on college students' academic success that post-secondary institutions invest substantial resources to develop.

Based on this background, it is vital for educational researchers, practitioners, and policymakers to better understand time management and how it is associated with other key determinants of college students' academic success. Self-regulated learning (SRL), generally described as students' active control of their cognitive, motivational, and behavioral engagement in learning (Panadero 2017; Pintrich and Zusho 2007; Zimmerman 2000), provides a theoretical framework that is well suited to address this need. SRL has proven to be an effective model for understanding university students' academic functioning (Cassidy 2011; Pintrich and Zusho 2007) and, with notable limitations discussed below, recognizes the importance of time management. In line with this view, our central purpose is to advance SRL as an effective guiding framework for understanding, studying, and improving university students' time management. In order to reach this overall objective, we divide the remainder of the article into four main sections. First, we affirm the importance of time management by reviewing its connection to indicators of academic success within post-secondary educational contexts. Second, we review the limited empirical findings that link time management with prominent motivational and strategic aspects of SRL. Third, we evaluate conceptual consistencies between time management and various processes essential to SRL. Fourth, we consider several antecedents and contextual determinants common to both time management and SRL. Within each of these sections, we advance the argument that time management is a core self-regulatory process that fits well within a model of SRL and we identify lines of research needed to elaborate on this framework.

The Importance of Time Management for University Students

Two complementary strands of evidence buoy the significance of time management among university students. First, empirical studies demonstrate positive associations between increased or more effective time management and indicators of time spent studying, increased engagement, and improved learning and achievement. As might be expected, spending more time studying tends to be associated with increased academic performance, especially when accounting for prior ability and the quality of engagement (Doumen et al. 2014; Dunlosky and Ariel 2011; Landrum et al. 2006; Plant et al. 2005; Witkow 2009). Researchers have also found positive relationships between indicators of time management and course grades or other signs of academic performance (Basila 2014; Britton and Tesser 1991; Burlison et al. 2009; Crede and Kuncel 2008; Huie et al. 2014; Kitsantas et al. 2008; Krumrei-Mancuso et al. 2013; Lynch 2010; Macan et al. 1990; Trueman and Hartley 1996). As an example of this work, MacCann et al. (2012) found that time management was positively correlated with GPA among both full- and part-time community college students, and that time management fully mediated the relationship between conscientiousness and GPA for the latter group. Further, based on a meta-analysis drawing on more than 20 studies using the *Motivated Strategies for Learning Questionnaire* (MSLQ; Pintrich et al. 1993), Crede and Phillips (2011) concluded that the scale most representative of time management was predictive of both course grades and overall GPA. Students who express more adaptive attitudes about being organized and planning their time tend to earn higher grades compared to their peers who are more antagonistic to managing their time (Britton and Tesser 1991; Macan et al. 1990). Finally,

people trained to manage their time tend to show improved performance outcomes compared to those who have not received such training (Claessens et al. 2007; Woolfolk and Woolfolk 1986). Green and Skinner (2005), for instance, reviewed time management training programs administered within a variety of organizational settings and concluded that they tended to have a positive effect on outcomes such as prioritizing, planning, reducing procrastination, and avoiding distractions. Despite this foundation of work, Claessens et al. (2007) concluded that the research linking time management and students' academic performance suffered from several noteworthy limitations. These shortcomings included a lack of consistency in the conceptual understanding and measurement of time management, an over-reliance on correlational designs, and findings based on examining time management within the workplace rather than academic contexts (Claessens et al. 2007).

A second distinct but complementary area of research centers on students' misappropriation of time and its relationship to their academic performance and personal well-being (Aeon and Aguinis 2017; Kim and Seo 2015; Steel 2007). Perhaps unsurprisingly, college students spend a great deal of their waking time engaged in activities that are not directly relevant to or that likely detract from their academic responsibilities and the accomplishment of important personal goals (Liborius et al. 2017; Nonis et al. 2006; Panek 2014). For instance, university students devote a great deal of time to social networking, watching videos, computer gaming, and other social or recreational endeavors that are unlikely to have a positive impact on their academic performance (Panek 2014; Tanner et al. 2009). Perhaps most illustrative of this issue, students participate in these behaviors even when they are attending class (Flanigan and Kiewra 2018). Many students also find it difficult to regulate their study time, keep up with their work, or even attend class regularly (Crede et al. 2010; Rytönen et al. 2012; van der Meer et al. 2010). Most definitively, based on two different meta-analyses covering an extensive literature researchers concluded that college students consistently report high levels of procrastination and other self-handicapping behaviors that reflect a misappropriation of time and effort (Kim and Seo 2015; Steel 2007). Along with this prevalence, there is strong evidence that these dilatory behaviors are associated with lowered academic performance along with increased anxiety and stress (Balduf 2009; Hensley et al. 2018; Kim and Seo 2015; Steel 2007). Similarly, excessive demands or pressure on students' time may undermine their intellectual functioning and academic performance (Chuderski 2016; Roskes et al. 2013). In sum, there is convincing evidence that university students often are not particularly wise about their use of time and that this shortcoming is associated with diminished academic performance and decreased well-being.

Together, these two areas of research support the need to have a well-articulated, comprehensive, and empirically supported theoretical framework useful for investigating and devising improvements for university students' time management. Unfortunately, the few existing models developed with a focus on time management are poorly suited for this purpose. A prime reason for this shortcoming is that, despite the many empirical studies conducted with university students, the conceptual models associated with this time management work typically do not include motivational, strategic, or other related factors known to play a role in academic success (Britton and Glynn 1989; Burt et al. 2010; Macan 1994; van Eerde 2015). Macan's (1994) popular process model of time management, for instance, stresses how the three dimensions of setting goals and priorities, mechanics (i.e., use of other time management strategies), and preferences for organization are associated with one another and with job-related affective experiences and performance. As well, this model recognizes only direct training as a major contextual determinant of the relevant time management skills and

attitudes. van Eerde's (2015) model, although it extends the relevant antecedents to include aspects of personality, also centers on work settings when considering time management and procrastination. Similarly, other models of time management have developed with a focus on adults within employment contexts (Britton and Glynn 1989; Burt et al. 2010). In sum, the theoretical models undergirding much of the research examining college students' time management do not incorporate many of the contextual, instructional, motivational, or strategic factors known to be important for post-secondary learning and achievement.

Self-Regulated Learning and Time Management

In contrast to the models with a narrower focus on time management (e.g., Macan 1994), SRL represents a more comprehensive framework that has successfully and repeatedly been used to understand post-secondary students' academic engagement, learning, and achievement (Cassidy 2011; Pintrich and Zusho 2007; Sitzmann and Ely 2011; Wolters and Taylor 2012). SRL refers to the processes through which students take an active, purposeful role in managing their own studying, learning, or academic engagement (Panadero 2017; Zimmerman 2000). Students who are actively involved in SRL work to achieve academic goals by managing different dimensions of the learning process including their own cognition, motivation, behavior, and social or instructional context (Boekaerts and Corno 2005; Efklides 2011; Pintrich 2000; Pintrich and Zusho 2007; Zimmerman 2000). Although there are several prominent models of SRL, most share foundational assumptions regarding the nature of this process and its role in determining students' academic success (Panadero 2017; Pintrich and Zusho 2007).

Prevailing Conceptions of Time Management and SRL

The significance of time management has not gone unrecognized within most prominent theoretical depictions of SRL. Managing time has been characterized as one dimension of the learning process that students can self-regulate (Dembo and Eaton 2000; Pintrich and Zusho 2007; Zimmerman and Risemberg 1997). As an example, Pintrich and Zusho (2007) stated that students' "time and effort planning or management" and monitoring of their time management can be understood as expressions of their regulation of behavior. Similarly, Zimmerman and Risemberg (1997) proposed that time is one of the key psychological dimensions that can be actively controlled by students when they are self-regulating their learning. Even when not explicitly identified as critical to SRL, time management often is an assumed part of the resource management, goal setting and planning processes, or simply subsumed under broader regulation or volitional processes (Boekaerts and Corno 2005; Efklides 2011; Winne and Hadwin 1998). For instance, Winne and Hadwin (1998) indicate that identifying time constraints occurs during the task definition stage and that students might make an effort to arrange for the time needed to use effective strategies in the goal setting and planning stage.

Research Linking Time Management and SRL

Time Management and Strategy Use In line with these theoretical assumptions, many researchers have found students' reported use of time management strategies to be correlated

positively with their reported use of cognitive, metacognitive, and other types of regulatory strategies (Britton and Tesser 1991; Burlison et al. 2009; Crede and Phillips 2011; Huie et al. 2014; Kesici et al. 2011; Kitsantas et al. 2008; Ranellucci et al. 2015; Sansgiry et al. 2006; Sen and Yilmaz 2016; Wolters et al. 2017). Based on their meta-analysis of the numerous studies using the MSLQ, for instance, Crede and Phillips reported moderately strong positive sample-size weighted mean observed correlations between the time and study environment scale and the rehearsal (.42), elaboration (.49), organization (.48), and metacognitive (.55) strategy use scales. Similar relationships have emerged from studies using other measures within less traditional instructional contexts (Basila 2014; Choi 2016) and with younger students (Xu 2010; Xu et al. 2013, 2014).

Unfortunately, few researchers have gone beyond reporting bivariate correlations when investigating how time management fits with students' broader use of learning strategies. In just a handful of studies, for instance, have researchers examined time management and other types of regulatory strategies together as potential predictors of students' academic success (Claessens et al. 2007). Still, this work provides some limited evidence that, even when accounting for other strategic aspects of SRL, students' reported use of time management strategies remains a positive predictor of notable academic outcomes. Indeed, in some cases, time management has proven a more potent predictor of academic performance than students' use of cognitive or metacognitive strategies (Crede and Phillips 2011). In one notable study, for example, Kitsantas et al. (2008) examined university students' self-reported time and study management together with indicators of their prior academic performance, metacognitive strategy use, and motivation as predictors of their later academic performance. Results indicated that, compared to their reported use of metacognitive strategies, students' time and study management was a stronger predictor of the grades students earned the following semester and two years later.

Time Management and Motivation A number of researchers also have found positive bivariate correlations between indicators of students' motivational beliefs, attitudes, or values and their reported time management. For instance, using various editions of the *Learning and Study Strategies Inventory* (LASSI; Weinstein et al. 2016), researchers have found moderate positive correlations between the subscale for time management and the two scales (i.e., Attitude and Motivation) that reflect positive motivational beliefs (Cano 2006; Melancon 2002; Olaussen and Bråten 1998; Olejnik and Nist 1992; Prevatt et al. 2006; Stevens and Tallent-Runnels 2004). Similarly, several studies using the MSLQ have revealed positive correlations between the time and study environment management subscale and those for task value, intrinsic motivation, and self-efficacy (Bembenutty 2009; Burlison et al. 2009; Crede and Phillips 2011; Huie et al. 2014; Kitsantas et al. 2008; Pintrich et al. 1993). Using other assessments, researchers also have found positive correlations between students' use of time management strategies and their self-efficacy, task value, and the adoption of mastery goals (Huie et al. 2014; Strunk et al. 2013; Xu 2010; Xu et al. 2014). In a sample of over 400 college students, for instance, Wolters et al. (2017) found bivariate correlations for self-efficacy and value with setting goals and priorities ($r_s = .32, .28$), mechanics ($r_s = .30, .32$), and preference ($r_s = .21, .28$) scales consistent with this pattern of relationships. Finally, students' preference for organization, or their attitudes regarding the need to follow a schedule or otherwise be organized about their time, also has been correlated positively with their reported use of time management strategies (Adams and Jex 1999; Macan 1994; Wolters et al. 2017).

Few researchers have examined students' motivational beliefs and attitudes and their involvement in time management using designs or analyses that produce more than bivariate correlations. With a small sample of African American college students, Bembenuity (2009) found that both self-efficacy and delay of gratification were positive predictors of students' reported use of time and environment management strategies when considered together in the same regressions. Across three studies that used multilevel analyses to explore large sets of both individual- and group-level predictors, Xu (2010), Xu et al. (2013), and Xu et al. (2014) found that increased self-reported efforts to manage their time spent doing homework were predicted by students' learning-oriented reasons for completing the work. Based on a structural model tested with a large sample of undergraduates, Strunk et al. (2013) found that students' self-reported adoption of mastery approach goals, defined as striving to develop competence, was a positive predictor for a somewhat indirect indicator of time management (i.e., timely engagement) based on both doing better and avoiding negative outcomes. Reported adoption of mastery avoidance goals, or striving to avoid failing to gain competence, was a weak negative predictor for timely engagement-approach whereas no connection was found with either performance approach or performance avoidance goals. In a path analysis, Yamada et al. (2016) also found that self-efficacy was a positive predictor of timely engagement-approach among undergraduates. Finally, perceived control of time, or the extent to which students believe that they have personal control over their time (Adams and Jex 1999; Macan 1994), has been established as a mediator between students' time management and behavioral, psychological, and achievement outcomes associated with academic success and well-being (Chang and Nguyen 2011; Macan 1994).

Limitations and Future Directions Overall, there is a foundation of research indicating that relationships between students' time management and other core aspects of SRL are consistent with expectations. Nevertheless, several shortcomings with this empirical work limit the ability to draw strong conclusions about the importance of time management to students' broader engagement in SRL. Here, we elaborate on three issues derived from the overall paucity of studies, a reliance on correlational designs, and issues with the assessment of time management.

One notable limitation, rooted in the relative paucity of prior empirical work, is a lack of evidence regarding fundamental relationships linking time management and other aspects of SRL. In particular, researchers need to better establish how students' motivational beliefs and attitudes are linked to their time management. Consistent with other types of regulatory strategies, researchers have found that students who hold more adaptive motivational beliefs and attitudes also tend to report using time management strategies more actively (see review above). The scant number of studies in which researchers have examined these relationships with more than bivariate correlations, however, indicates a clear need for more work that evaluates whether and how particular facets of motivation (e.g., self-efficacy, achievement goals) are tied to time management. In addition, researchers need to explore the possibility that students' time management influences their motivation. For instance, students' perceptions about the amount of time available for a task and their use of strategies to plan and monitor their time might increase their self-efficacy for learning (van Den Hurk 2006; Usher and Pajares 2008). As well, students' ability to regulate the amount of time available to complete their academic work might influence their achievement goals. In line with assumptions regarding the link between students' adoption of achievement goals and the deadlines or time pressure associated with a task (Ames 1992), for instance, students who provide themselves

with ample time for completing challenging tasks might enable their adoption of mastery goals whereas those who fail to allocate sufficient time might tend to adopt performance avoidance goals. Students' time management also might provide a mechanism for ameliorating the opportunity costs associated with a task. Opportunity costs reflect the activities, events, resources, or other advantages one must sacrifice, delay, or repudiate in order to pursue a particular academic outcome (Flake et al. 2015). These costs are unavoidable to the extent that any time spent working toward one goal necessarily reduces the time available for other activities. However, students who can effectively manage their time might be able to allocate sufficient effort to their academic work while also arranging their schedules such that they can also pursue social goals. In sum, there are many potentially fruitful lines of research examining the reciprocal connections between students' motivation and their time management that need further investigation.

A second notable shortcoming is that most of the findings linking time management and both the motivational and strategic aspects of SRL rely exclusively on bivariate correlations. As a result, research designs (e.g., experimental) that examine and provide a greater understanding of the potential causal relationships between time management and other facets of SRL are needed. One important line of research, for example, concerns the causal pathway(s) that accounts for the positive relationships observed between students' active management of their time and other regulatory strategies. One possible explanation is that students' use of various regulatory strategies, including their time management, might be a function of some common aptitude, trait, or dispositional antecedent (e.g., conscientiousness). A second explanation is a causal pathway leading from students' time management to their active regulation of other aspects of their learning. It might be, for instance, that effective time management produces increased amounts of study time that students then devote to using more effective but effortful and time-consuming learning strategies. Alternatively, students might initially commit to using particular learning strategies for completing a task and these choices determine the extent to which students must manage their time. Because they lead to different conclusions about how best to improve learning and achievement, teasing apart the relative strength of these possible causal pathways is a necessary step toward developing useful interventions. Put differently, there is a need to better understand the overlap, bridges between, or potential causal connections between what has previously been described as the performance and commitment pathways (Corno et al. 2002; Snow 1989) or the skill and the will dimensions of SRL (Boekaerts 1996; Zusho and Pintrich 2003).

A third major shortcoming of past research arises from fundamental issues with the instruments most often used to assess time management. Similar to SRL more generally (Winne and Perry 2000; Wolters and Won 2018), researchers have relied most heavily on self-report surveys reflecting two broad categories to assess time management. One category includes instruments developed with a specific focus on time and/or its management and that, therefore, aim to cover all of its major relevant dimensions. The *Time Structure Questionnaire* (TSQ; Bond and Feather 1988), the *Time Management Questionnaire* (TMQ; Britton and Tesser 1991), and the *Time Management Behavior* scale (TMB; Macan 1994) are key examples of this type of survey. A second category includes instruments that assess time management as just one of several factors thought to be predictive of learning or achievement. Based on their roots and popularity among researchers studying SRL, the most relevant instruments within this category are the MSLQ (Pintrich et al. 1993) and the LASSI (Weinstein et al. 2016).

Despite their prior contributions and their continued usefulness for some purposes, existing instances of both types of self-report assessments have fundamental weaknesses that limit their usefulness for researchers studying university students' time management, especially within an SRL framework. One shortcoming concerns validity claims associated with content coverage (Wolters and Won 2018). The available instruments fall well short of assessing the full range of strategies that are theoretically important when considering time management from the perspective of college students' SRL. A fundamental reason for this shortcoming is that researchers developed many of these instruments without any clear assessment framework, and certainly not within a model of SRL. For instance, Bond and Feather (1988) developed the TSQ using non-student adults without regard to any theoretical model and with a focus on assessing the perceived use of time rather than actual time management. As well, Macan et al. (1990) created items on the TMB based on tips, tricks, and tactics found in commercial how-to books rather than any theoretical model. The two major instruments developed by SRL researchers are even more limited when considering their content coverage of time management. It is difficult to argue that the single short scales devoted to time management on the MSLQ and the LASSI provide adequate coverage of the broad array of beliefs and skills that contribute to effective time management. Further, the relevant scales from these two instruments include items that confound time management with other theoretically distinct constructs (i.e., environment control, procrastination). Hence, researchers would benefit greatly from the development of additional time management measures including both more rigorous self-report surveys and assessments derived from other forms of data (e.g., trace data, observation). For instance, it may be possible to develop observational or trace methods to capture students' actual use of to-do lists, electronic calendars, or other external supports for scheduling and prioritizing tasks. As well, there is evidence that experience sampling or data mining methods could be developed to assess when and/or where students actually complete their academic work (Winne and Baker 2013; Xie et al. 2019).

Overall, the findings of past studies generally are consistent with the theoretical assumptions that time management is an important self-regulatory process that promotes college students' academic success. The overall paucity of relevant studies and other key limitations, however, point to the need for additional empirical work examining time management, its relationships with other core aspects of SRL, and its relative ability to influence college students' academic success. In addition, one key to pursuing future investigations is the development of an effective instrument or methodology for assessing time management that is rooted within a model of SRL.

Time Management and the Phases of Self-Regulated Learning

A fundamental prerequisite to rigorous empirical work is a more comprehensive and thorough conceptual understanding of how time management fits within the framework of SRL. Despite its acceptance as inherent to SRL, a systematic evaluation of the role of time management within this broader framework is almost entirely absent. In one previous effort to provide a careful consideration of the intersection of time management and SRL, Zimmerman et al. (1994) reviewed research on academic study time and highlighted its links with some key motivational and self-regulatory processes. Although noteworthy for stressing its potential, Zimmerman et al. failed to spark any substantial attention to the role of time management

within the framework of SRL. Twenty-five years later, therefore, time management remains a theoretically significant but underdeveloped and underexamined dimension of SRL. A systematic effort to consider time management within a model of SRL, in other words, is overdue. We address this need by evaluating how time management fits with several processes essential to SRL.

Most prominent models propose that SRL includes multiple discernable phases or stages, although researchers do not always differentiate them in the same way (Panadero 2017). Researchers typically do not view the phases of SRL as occurring in a strict time-ordered sequence or as causally connected in a linear fashion (Pintrich and Zusho 2007; Winne and Hadwin 2008; Zimmerman 2000). Rather, these phases provide a heuristic to indicate that students are active in an interactive and adaptive fashion before, during, and after their involvement in academic work. Within these phases, researchers also have identified a varied number of processes that are essential to students' successful SRL (Panadero 2017). In this section, we use the structure provided by these phases and notable processes associated with each to evaluate how time management fits within the framework of SRL. Summarized in Table 1, we structure our discussion by first providing a general characterization of a particular phase of SRL, followed by a description of specific processes within that phase, and finally with an evaluation of its application to time management.

Forethought Phase

The forethought phase refers to the set of processes that have precedence when students are first anticipating, considering, and initiating their involvement in an academic task (Pintrich 2000, 2004; Zimmerman 1989, 2000). Students' activation of various forms of knowledge, beliefs, attitudes, and perceptions associated with the task at hand is one important process within this phase (Efklides 2011; Pintrich and Zusho 2007; Winne and Hadwin 1998; Zimmerman 2000). A second major process within forethought is students' goal setting and strategic planning of how they are going to go about completing a task (Pintrich and Zusho 2007; Winne and Hadwin 1998; Zimmerman 2000). Drawing from multiple models, we refer to these two processes as task analysis and planning in our evaluation.

Task Analysis One critical process within the forethought phase is the activation of prior knowledge, beliefs, and attitudes that students use to construct a working understanding of a task (Pintrich 2004; Winne and Hadwin 1998; Zimmerman 2000). A core type of information that students activate involves their current knowledge with regard to a particular concept, topic, or content domain. For example, students tasked with reading a novel set during World War I might think about what they already know and understand about this era in history. In a similar way, students also might activate epistemological beliefs associated with the broader domain or subject area (Muis 2007). Students might consider, for instance, what they believe about where knowledge in history comes from, whether it is complex or simple, and how it is justified. Students might also anticipate the cognitive and behavioral steps that will be necessary to complete the task along with information about what resources are available to complete it (Boekaerts 1996; Winne and Hadwin 1998). For example, they might think about the comprehension strategies they will need to use when reading the assigned novel and consider whether they have ready access to the book, a highlighter, a published summary of the novel, or other relevant materials. Further, students also activate a wide range of motivational beliefs and attitudes as well as emotions associated with the domain, topic, or the task

Table 1 Summary of process associated with SRL and their application to time management

Process	Description within SRL	Application to time management
Forethought		
Task analysis	Activate & consider knowledge, beliefs, attitudes such as: - Content knowledge - Strategic knowledge & preferences - Motivational beliefs & attitudes - Emotional associations - Epistemological beliefs	Activate & consider knowledge, beliefs, attitudes such as: - Estimations of time needed - Willingness to spend time and effort - Strategies for managing time - Beliefs about personal productivity - Information about task deadlines
Planning	- Set goals - Establish standards for evaluating goal progress - Select strategies for task completion	- Set goals & priorities for amount of time to do work - Set goals for when work will be completed - Establish time-related standards for progress or success - Select strategies for managing time
Performance		
Enactment	Initial execution of plans for strategic engagement & task completion	Initial execution of strategic plans regarding when & how long they will work on completing a task
Monitoring	Awareness of various aspects of engagement and progress - Cognition - Motivation - Context - Behavior	Awareness of time-related thoughts & actions - Passage of time - Chronology of task
Evaluation	Compare monitoring results to goals & standards to produce feedback on: - Rate of progress toward learning, motivational, emotional goals - Effectiveness of cognitive, metacognitive, motivational strategies - Personal abilities or skills	Compare monitoring results to goals & standards to produce feedback on: - Amount of time passing - Perceived rate of time passing - Chronology of engagement
Adaptation	Modifications to on-going engagement regarding: - Change goals or standards - Switch learning strategies - Refine/improve learning strategies - Abandon learning goals or plans	Modifications to on-going engagement regarding: - Allot more/less time - Change time management strategies - Refine/improve time management strategies - Abandon time-related goals or plans
Post-performance		
Reflection	Look back & consider experiences & outcomes of task - Evaluate success/failure of performance Production & refinement of metacognitive knowledge or beliefs Inferences about future SRL cycles	Look back & consider time-related experiences & outcomes - Evaluate whether deadline was met - Reflect on perceived amount of time devoted to task - Reflect on perceived speed of time passage - Consider chronology or when task was done/completed - Consider motivation and emotions that impacted time spent Production & refinement of time related beliefs - Time estimation - Revision of time management strategies - Meta-level knowledge of self linked to time

Table 1 (continued)

Process	Description within SRL	Application to time management
Reaction	Generate attributions for outcomes Emotional response to attributions Establish expectations about later tasks	Inferences about future SRL cycles - Strategies that will be useful in the future - Perception of ability linked to time spent Consider time-related information when forming attributions

(Pekrun et al. 2002; Zimmerman and Schunk 2012). For instance, students might consider the likely usefulness of the to-be-learned material, the interestingness of the activity, their likelihood of success, reasons for wanting to engage in the task, and the possible consequences of success or failure. The activation and consideration, whether explicit or implicit, of all the various forms of knowledge, beliefs, and attitudes contribute to a comprehensive working understanding of the task including an initial motivation for completing it. Researchers have demonstrated consistently that many of the different forms of knowledge, beliefs, and attitudes activated through task analysis are important for understanding students' engagement, learning, and academic achievement (Burnette et al. 2013; Linnenbrink-Garcia and Patall 2016; Muis 2007; Schraw 2006; Sinatra et al. 2014).

Task analysis and time management Task analysis and time management also are closely interconnected (see Table 1: Task analysis row). Students' activation of the various forms of knowledge and beliefs needed to construct an understanding of the task would also, for instance, include how much time may be required to complete the task (Buehler and Griffin 2015). Students might estimate that a task will take little time if their task analysis leads them to believe that they already know a great deal about a topic, that understanding will come from memorizing simple disconnected facts, and that the necessary learning strategies will not require much effort. As well, the motivational attitudes, beliefs, and emotions activated during forethought will influence students' willingness to devote time to the completion of a task. Students who perceive the assigned material as important, anticipate that a task will be enjoyable, or who believe that they are capable of achieving success should, on average, allocate more time to the task. In contrast, students who feel a sense of anxiety, fear of failure, or anticipate boredom when anticipating a task will likely reduce the amount of time they are willing to invest. In short, the knowledge, beliefs, and attitudes activated during the forethought phase according to traditional views of SRL also will contribute to an awareness of how much time a task might take and how much time one is willing to provide that serve as basic inputs for their time management.

Further, some of the beliefs, knowledge, and memories activated during task analysis can be more directly linked to time or the time management process. For instance, students might activate information regarding the self, such as when they work most productively (e.g., late at night) or whether they prefer to do their work under the pressure of an imminent deadline. Students might also consider what they know about their personal schedule, including when and how much time they have available for a task. In light of a particular task, students also might activate information about when it might best be done (e.g., right after class), when necessary resources will be accessible (e.g., library is open), and when it must be completed (i.e., the deadline). Finally, students could also activate knowledge about the specific methods

they could use to manage their time (e.g., to-do list, reminder notes), including the relative efficacy and limitations of each with regard to the situation at hand.

Planning A second major forethought process is planning (see Table 1: Planning row), which includes students' efforts to determine what outcomes they aim to achieve and the strategic steps they will take to reach them (Eilam and Aharon 2003; Pintrich 2004; Winne and Hadwin 1998; Zimmerman 2000). Within the context of a particular task, students are likely to adopt a profile of initial goals that reflect a diverse set of learning, affective, social, and personal outcomes they hope to achieve (Locke and Latham 2019; Winne and Hadwin 1998). These goals, it should be noted, might not be equally important or in harmony with one another. Planning also includes identifying implicit or explicit standards for determining progress or accomplishment with regard to particular goals. A general goal of wanting to write a good paper, for instance, could be judged based on the number of pages written, the inclusion of certain information, or receiving positive feedback. Finally, selecting the particular actions, tactics, or strategies that they will use, at least initially, in an effort to reach the goals they have set is also a core part of planning (Pintrich and Zusho 2007). Assigned to read a short story, for example, students might decide that they want to understand the main points and get a good score (goals), so they decide to strive for at least 9 of 10 on the quiz (standard) by reading, highlighting, and then memorizing key terms (strategy selection). Planning, goal setting, and other related forethought processes are associated positively with students' effort, learning, and academic performance (Buehler and Griffin 2015; Locke and Latham 2019).

Planning and time management Students' planning and their time management are closely connected. Planning decisions that are focused on cognitive, motivational, or emotional concerns are likely to have implications for students' use of time. Some of the learning goals and standards for success that students adopt when beginning a task, for instance, will inevitably require more time to satisfy than others do. Similarly, certain learning or motivational strategies they elect to use will, by their nature, take longer to execute than others. As an example, students who elect to use a note-taking strategy in order to read a textbook chapter to a high level of comprehension also are, at least tacitly, deciding how much time they will devote to the task.

In line with much past work on time management (Claessens et al. 2007; Macan 1994; van Eerde 2015), the processes associated with planning also can be directly tied to students' purposeful use of time (see Table 1: Planning row, Time management column). The goals that students set, for instance, can include when (e.g., after dinner) and for how long (e.g., two hours) they will work on a certain task (Dunlosky and Ariel 2011). In fact, setting goals and establishing priorities in the face of multiple important commitments is considered central to effective time management (Britton and Glynn 1989; Macan 1994; Richards 1987). The standards that students establish for judging their progress also can be rooted in expectations about their use of time. As an example, taking a long time to complete a reading might be interpreted as a problem requiring a change regardless of how well the material is being understood. Finally, the strategies that students activate in order to ensure successful completion of a task can include efforts to regulate when, for how long, and under what conditions they will devote effort to completing their academic work. For instance, students might plan to use daily to-do lists or reserve time on a calendar in order to ensure sufficient and productive periods of time are available to complete an important assignment.

Performance Phase

The second phase of SRL becomes conspicuous once students transition from activating knowledge, setting goals, and forming plans to involvement in the actual work needed to complete a task (Panadero 2017). For example, students open their textbook and begin to read, they create a document and begin to type, or they open their notebook to study their notes. According to models of SRL (Pintrich 2000; Zimmerman 2000), however, students who are self-regulating their learning do not just initiate and then mechanically follow a set of procedural steps until their academic work is done. Instead, after beginning an academic task, these students instigate and sustain an active feedback loop through which they monitor their engagement, evaluate the information it provides, and respond in ways that sustain or improve their progress toward their goals. Drawing across different models (Boekaerts and Corno 2005; Pintrich 2000; Winne and Hadwin 1998; Zimmerman 2000), we identify four processes important to this phase of SRL and evaluate their relationship with time management.

Enactment Students' enactment or execution of the original plans, actions, or strategies intended to complete a particular task marks a beginning of the performance phase (Pintrich and Zusho 2007; Winne and Hadwin 1998). That is, students' initial and ongoing steps in using the various cognitive learning strategies intended to accomplish a task are an important aspect of their SRL (Zimmerman 2000). Students faced with a textbook reading assignment, for instance, may initially activate a range of strategies that include skimming text, rereading, highlighting, self-imagery, note-taking, or writing summaries. Zimmerman (2000) categorized this use of various cognitive and metacognitive strategies (e.g., imagery, attention focusing) under the heading self-control. If monitoring (see below) produces no indication of a setback, difficulty, or lack of progress, these original strategic efforts may continue unabated and without any substantial changes until a task is completed. The positive connection between students' increased use of cognitive and metacognitive strategies and their learning and achievement is supported by a substantial amount of prior empirical research (Dent and Koenka 2016; Donker et al. 2014; Hattie et al. 1996).

Enactment and time management As with SRL more generally, enactment of time management begins as students initiate their plans regarding when and for how long they will devote time to an academic task. For instance, this process of self-regulation is illustrated when students make and consult a calendar, to-do list, or activate some other strategy that influences when they will complete academic work for the day. Although many specific time management strategies have been identified (Bond and Feather 1988; Britton and Glynn 1989; Macan et al. 1990), three related points about students' enactment of these strategies are worth noting. One, the full range of strategic thoughts and actions that can be considered as supporting time management is broad and continues to evolve. Additional technology-based aids for time management, for instance, continue to be developed and made available to students. Two, the strategies that students enact might be more directly intended to manage their time in an effort to reach non-academic goals with any impact on the time available for academic tasks more of a by-product. Three, students' strategic efforts to manage their time might sometimes manifest in their decision-making regarding their cognitive engagement or other actions that do not appear overtly connected to their control of time. For instance, faced with an assignment to read their textbook, students might elect to skim and highlight in order to limit the time they are required to spend. Together, these points suggest that identifying all of the specific strategic

efforts that students enact as part of their overall time management could be complex and needs to be studied within a model that accounts for other regulatory processes.

Monitoring For Pintrich (2000), monitoring represented a unique and sufficiently critical process that it was considered a unique phase apart from the control aspects of performance. In line with other prominent theorists (Panadero 2017; Zimmerman 2000), however, we characterize monitoring as part of the broader performance phase. Regardless of this organizational distinction, monitoring involves students' on-going awareness of various aspects of their own engagement during academic work (see Table 1: Monitoring row). Zimmerman (2000), using the term self-observation, described this process as involving students' tracking of their own performance, the conditions of the task, or the products of their engagement. Looking more broadly, Pintrich and Zusho (2007) argued that monitoring involved students' continuing attention to the process and products of their own cognition, motivation, emotions, and behavior. With regard to cognition, for instance, monitoring includes maintaining an awareness of one's degree of understanding, comprehension, or learning. Students' monitoring of their motivation and emotion also have been highlighted as key parts of SRL (Miele and Scholer 2018; Pekrun et al. 2002). Students' awareness of the social, cultural, and other contextual aspects of the environment in which a task is being completed reflects another facet of monitoring. Perhaps more so than other aspects of SRL, students' ongoing efforts to attend to their own engagement often can proceed below the level of consciousness, becoming apparent only when a problem triggers the need for a response (Butler and Winne 1995). Still, monitoring also can occur more overtly through deliberate actions such as self-questioning, recording observable actions, or generating judgments of learning (Nelson and Narens 1990; Pintrich and Zusho 2007). Research indicates that increased and more effective monitoring is predictive of improved performance on learning or academic tasks (Guzman et al. 2018; Harkin et al. 2016).

Monitoring and time management Students' ongoing awareness of how their time is being used is portrayed as a building block of effective time management (Claessens et al. 2007; Richards 1987). This awareness can be driven by more formal self-observations such as when students keep a written log to track how long they work (Zimmerman 2000). Alternatively, it can be more informal, reflecting a general impression about whether time is passing quickly or dragging on slowly. In addition to the objective amount of time, individuals' perceptions of how much time has passed when involved in the task also is a function of the extent to which they actively monitor their time and their affective and motivational experiences (Conti 2001; Csikszentmihalyi 1996; Gable and Poole 2012). In addition to the amount of time that is passing, time management also depends on students' monitoring of various aspects of the chronology of completing their academic work. For instance, students can monitor when during a day (e.g., late at night), a week (e.g., weekend), or in relation to some particular timeline (e.g., relative to deadline) they are devoting time to their academic work. Students' monitoring might focus on short-term episodes (e.g., how long have I been working on this paper today?) or longer time horizons (e.g., how much time have I devoted to this paper since I started it last month?).

Evaluation Closely related but theoretically distinct from monitoring, evaluation involves taking what has been observed about one's ongoing engagement and comparing it to established expectations, goals, or standards (Winne and Hadwin 1998). The evaluation

process is critical because it generates feedback about the rate of progress toward goals, effectiveness of particular strategies, and awareness of personal capabilities (Butler and Winne 1995). Thus, evaluation produces insights regarding students' ongoing efforts and anticipated outcomes including the likelihood of eventual success or failure for the array of goals they hope to achieve. Judgments of learning, for instance, reflect students' evaluation of how well they understand, comprehend, or have mastered some learning task (Pintrich et al. 2000). Overall, these types of judgements are predictive of improved performance on learning tasks (Rhodes and Tauber 2011). Analogous judgments can arise when students consider their motivational or emotional state and compare it to their expectations, goals, or aspirations. As an example, students might take stock of their ongoing enjoyment of a learning task and form judgments as to whether their motivational or emotional experience is consistent with their expectations (Miele and Scholer 2018; Wolters 2003). Roughly put, evaluation leads students to draw two types of conclusions regarding their current state or progress toward their goals. Students can conclude either that their efforts are going reasonably well and that they are making adequate (or even good) progress or that their enacted plans and progress toward their goals are not proceeding as anticipated. In the former case, students likely will continue with minor, if any, changes to their ongoing engagement. In the latter case, students might be prompted into one or more efforts to change what they are doing and thus transition to adaptation (see below). To the extent that evaluation spurs students to reconsider their beliefs about the task, themselves, their strategies, or their goals, it also provides a bridge that may return students' to processes within the forethought phase.

Evaluation and time management Evaluation focused on time-related aspects of a task is an essential part of time management. This aspect of evaluation includes comparing what is recognized about the amount of time being devoted to a task or its chronology with established expectations, plans, or external standards. As they are working on a task, for instance, students might recognize that they are progressing slowly and will require more time than projected to finish. Similarly, students can compare when they actually are involved in a task with when they anticipated doing it or when it should have been done (i.e., in relation to a deadline). If these evaluations fail to indicate any substantial problem or discrepancy from their expectations, students are likely to continue operating without any change. However, there is strong evidence that students are not particularly good at predicting how long a task will take or even estimating how much time completed activities actually consumed (Beuhler et al. 2010; Francis-Smythe and Robertson 1999a; Pychyl et al. 2000; Tanner et al. 2009). Hence, perceiving that an activity is taking longer than expected or is not being done when planned is likely quite common.

Adaptation In response to concerns revealed through monitoring and evaluation, adaptation encompasses students' deliberate efforts to modify, supplant, or abandon strategically their initial attempts to complete a task (see Table 1: Adaptation row). After perceiving that they are not understanding concepts in a lecture, for instance, students might shift from attentive listening to an active note-taking strategy. Students also can initiate strategies to regulate their emotional state (e.g., deep breathing), their motivation (e.g., self-consequating), or aspects of the context (e.g., peer group) as a way of bolstering their persistence at the task (Miele and Scholer 2018; Pintrich and Zusho 2007; Wolters 2003). Adaptation processes also can be activated based on shifts in the saliency or availability of particular strategies or goals (Winne and Hadwin 1998). Students might, for example, modify how they go about preparing for an

exam because they get an unexpected opportunity to join a study group. Within many models (Panadero 2017), these purposeful attempts to regulate or exert volitional control over one's own ongoing thinking, motivation, emotions, or behavior represent the essence of SRL. That is, students are not truly self-regulating their learning if they do not respond strategically and effectively to feedback about their progress.

Adaptation and time management Adaptation processes also are a necessary dimension to students' effective management of their time. Similar to other areas of SRL, adaptation processes arise when students encounter time-related concerns about their participation in a task. Students might activate adaptation processes after becoming aware that a task is taking longer than anticipated, or when distractions, interruptions, or other impediments disrupt their planned use of time. When faced with these situations, furthermore, students might strive to maintain progress toward their goals in ways that directly reflect time management. For example, students might immediately allocate additional time to a task, increase the pace at which they attempt to work, or postpone doing work until they are more physically or mentally prepared to be productive. Time management is also implicated when students switch to a different learning strategy, bolster their own motivation, or regulate their physical state (e.g., ingest caffeine) or their environment (e.g., switch locations) in an effort to be more productive with their time.

Post-Performance Phase

The set of processes that prevail after active involvement in a task has ended are proposed as a distinct phase within most, but not all, prominent models of SRL (Panadero 2017). Zimmerman (2000), for example, titles this phase self-reflection and proposed that self-judgment (e.g., evaluating and drawing causal attributions about the outcomes of a task) and self-reaction (e.g., emotional responses) as described by Bandura (1986) are two of its major processes. Similarly, Pintrich and Zusho (2007) use the title reflection and reaction and portray this phase as including students' post hoc considerations and responses to various aspects of their cognitive, motivational, behavioral, and contextual regulation. In order to distinguish this phase of SRL more easily from the specific processes that it encompasses and to emphasize its relation to task completion, we refer to it using the generic title post-performance.

Reflection Fundamentally, reflection describes the process through which students look back and consider their engagement experiences as well as the outcomes, consequences, or products that have occurred during their completion of a task (Zimmerman 2000; Pintrich 2000). Described as self-judgment (Zimmerman 2000) or self-assessment (Panadero et al. 2016), this process comprises evaluation of one's outcomes with regard to previously set goals or performance criteria (see Table 1: Reflection row). For example, students might think about the score they earned on a quiz or the length of a paper they submitted and consider how these outcomes compare to their own expectations or to some other standard for success. The process through which students draw conclusions about the results of this evaluation also is an important aspect of the post-performance phase of SRL (Pintrich 2000; Zimmerman 2000). In other words, consistent with Weiner (2005), the process through which students form causal attributions to explain the reasons for their relative level of failure or success is important to this aspect of SRL. Overall, reflection has much in common with evaluation with the

distinction resting primarily on whether students are still involved in completing the task (i.e., evaluation) or have finished and have access to performance feedback (i.e., reflection). The distinction between these two processes can be unclear (and perhaps unnecessary) if a task extends over time or includes multiple distinct episodes of engagement. Prior research indicates that students' self-assessments, causal attributions, and other aspects of reflection can be useful for understanding their motivation and subsequent academic performance (Dunning et al. 2004; Panadero et al. 2016; Sitzmann et al. 2010; Weiner 2005).

Reflection and time management Processes associated with reflection are connected with students' time management in several ways (see Table 1: Reflection row, time management column). In particular, reflection is likely to include consideration of two types of time-related results associated with completing a task. One, students might consider the amount of time that was required to finish the task, especially in comparison to their expectations, imposed time limits, or relative to others completing the same activity. That is, students might reflect on the amount of time they devoted to a task and whether it was longer, shorter, or in-line with their expectations, a standard, or some external criteria. Within this process, students' perceptions of how quickly time passed are likely more relevant than the actual amount of time a task consumed (Conti 2001; Gable and Poole 2012). Two, students might consider the chronology of when a task was completed (e.g., time of day, day of week) and whether it met any externally stipulated deadlines, personal priorities, or schedule. For example, students might recognize that they wrote a paper late at night just before it was due rather than over the previous weekend as they had intended.

Either type of time-related reflection might serve as a catalyst for the attribution process. For instance, students' understanding of when they finished and how much time was required to complete a task might be instrumental in drawing conclusions about their relative success or failure. Students might conclude, for example, that they did poorly if they finish a task too close to a deadline, much later than their peers do, or if it took longer than the time allotted by an instructor. In contrast, finishing an activity more quickly or earlier than expected might promote feelings of success. These perceptions of success or failure, especially when they conflict with expectations, are what spark students' need to identify a causal explanation for the outcomes of a task (Weiner 2005). The specific causal attributions that students use to explain their perceived success or failure can also arise from their understanding of when and how much time was required to complete a task. Similar to the use of effort, students might blame the amount of time they devoted (e.g., not long enough), or when they worked (e.g., too late at night) as the particular reason for their failure or success.

Reaction Reaction processes include the varied ways in which students respond to the consequences, products, or outcomes that arise from completing a task. For example, Zimmerman (2000) highlighted self-satisfaction, or students' feelings regarding whether they had done well or not, as one important form of self-reaction. More broadly, students' immediate, and perhaps reflexive, affective, and motivational experiences associated with finishing a task or receiving feedback regarding their level of success or failure are part of this process. In particular, the psychological consequences produced from the attribution process are also viewed as central to this aspect of SRL (Pintrich 2000; Zimmerman 2000). Derived from how they perceive their causal attributions with regard to locus, controllability, and stability, these psychological consequences include students' emotional response as well as their expectations regarding success on later tasks (Weiner 2005). These reactions are

important because they impact students' later goal setting, planning, and motivation within future cycles of SRL (Zimmerman 2000).

Reaction also includes the production and refinement of meta-level knowledge, beliefs, or attitudes sparked by the feedback generated when students recognize the outcomes of their engagement and compare them to some standard (Butler and Winne 1995). That is, students' reaction includes their confirmation, revision, or addition to their metacognitive knowledge regarding the tasks, strategies, or themselves as learners. After reflecting on an episode of studying a textbook, for instance, students might react by modifying their beliefs about the task (e.g., this textbook is difficult to read), the strategies they used (e.g., highlighting does not improve recall), or themselves (e.g., listening to music helps my attention). Of note, these changes can extend beyond their cognitive functioning to include refinement of motivational (e.g., I enjoy this type of math), emotional (e.g., I feel ashamed of my math skills), epistemic (e.g., knowledge in math is complex), or other types of beliefs, attitudes, or knowledge. Whether they are newly revised or confirmed, the beliefs and knowledge that are established through this process will guide students' subsequent decision-making, planning, and engagement when beginning successive cycles of SRL (Winne and Hadwin 1998; Zimmerman 2000).

Reaction and time management These key aspects of reaction are also closely tied to students' time management. Students' emotional response and expectations for success, for instance, might be a function of how they perceive a particular time-related cause with regard to its locus, stability, and controllability. More positive emotions and higher expectations for later success should stem from believing that the amount of time devoted to a failed academic task can vary and is personally controllable. In contrast, feelings of hopelessness and poor expectations for later success might follow if students believe that their available time is limited and unlikely to increase through any effort on their part. In line with this premise, greater perceived control of time has been associated with increased use of time management strategies and with indicators of academic success and personal well-being (Claessens et al. 2007; Macan et al. 1990).

As well, students' reaction to time-related outcomes (e.g., how long it took to complete a task) might include confirmation, slight modifications, or more complete conceptual changes to students' meta-level knowledge regarding tasks, strategies, or themselves. For instance, students might revise beliefs about themselves (e.g., I write best in the morning), the type of task (e.g., Writing takes lots of short periods of effort), or the learning strategies involved (e.g., Outlining takes longer than previously thought). Reaction might also include changes to students' time-related knowledge regarding particular learning strategies. For instance, students might revise their beliefs about the time required to use particular strategies (e.g., re-writing notes takes a great deal of time) or when certain strategies are most effective (e.g., studying in the library is only good in the morning when it is less crowded). Of course, students' awareness and evaluation of time-related outcomes might also drive the production of new or updated knowledge about specific time management strategies. As an example, students might modify their beliefs about how useful it is to use a calendar, daily to-do lists, or electronic reminders when assigned a lengthy paper. In sum, students' post hoc reactions to when and how much time it took to complete particular academic activities are likely to include the generation and revision of an array of meta-level beliefs, attitudes, and knowledge that will later serve as a basis for their future time management decision-making.

Summary

Overall, our evaluation in this section supports two key points. One, in comparison to past efforts (e.g., Zimmerman et al. 1994), it more firmly establishes that SRL provides a rich and comprehensive framework for identifying and understanding an array of self-regulatory processes that are likely involved in effective time management. Situating time management within a model of SRL highlights a number of processes that, although considered central to SRL, have received little attention from researchers investigating time management. These underappreciated processes include, for instance, the activation of prior task knowledge, ongoing perceptions of the time devoted to a task, and post hoc attributions and reflections on the effectiveness of time regulation strategies. Two, our evaluation demonstrates the many ways in which processes commonly viewed as foundational to SRL might, in no small part, be a function of students' time-related knowledge, beliefs, and attitudes or by students' understanding and use of strategies for managing their time. In other words, the building blocks of time management are likely intertwined and influence students' involvement in the more traditional aspects of SRL. These points, together with the overall paucity of prior empirical studies, indicate that researchers have not sufficiently attended to the importance of time management as central to students' overall SRL and that there are many avenues of research that need to be explored.

Shared Antecedents of Time Management and Self-Regulated Learning

Thus far, our discussion has focused on evaluating time management in relation to processes that researchers view as inherent to the larger system of SRL. In this section, we shift our attention to factors that researchers more typically consider as external, antecedent, or causally related to time management and SRL. Our goal here is not to provide a comprehensive review of all these factors, but rather to illustrate further the similarities, interdependence, and shared etiology of time management and SRL and to highlight future lines of research to pursue.

Personality Traits and Dispositions

Researchers long have recognized individual differences in cognition, motivation, and emotion as important for understanding students' academic functioning (Kanfer et al. 2017; Snow et al. 1996). Within theoretical models of SRL, traits, dispositions, aptitudes, and other more stable personal characteristics are typically portrayed as precursors to the central motivational and regulatory processes (Winne and Hadwin 1998; Pintrich and Zusho 2007). Researchers have provided robust support for this assumption with regard to a number of these individual differences (Bidjerano and Dai 2007; Komarraju et al. 2009). For instance, students' level of conscientiousness predicts their use of cognitive and metacognitive strategies (Bidjerano and Dai 2007; McCrae and Lockenhoff 2010). Similarly, achievement motives, implicit theories of intelligence, and epistemological beliefs each have been tied to various indicators of students' motivation and, to a lesser extent, their use of self-regulation strategies (Bartels et al. 2010; Muis 2007). Similar factors are important for understanding students' time management, time use, and procrastination, although the evidence is much more limited (Claessens et al. 2007;

Liu et al. 2009; MacCann et al. 2012; Rickert et al. 2014; Steel 2007). Douglas et al. (2016), for instance, found that two measures indicative of undergraduates' conscientiousness both were positive predictors of their setting goals and priorities, mechanics, and preference for organization. The commonalities in these relationships provide support for the integration of time management and SRL by indicating that they might share a similar etiology. That is, personality, achievement motives, and other trait-like individual differences might serve as important influences on both students' time management and their SRL more broadly. These findings also suggest that additional research is needed to examine how factors known to predict SRL might be important for understanding students' time management. For instance, students' beliefs about whether their intelligence can be improved through effort or whether learning occurs quickly should both be explored as potential antecedents to the amount of time they allocate to academic learning.

In addition, and perhaps more interestingly, the recognition of time management as a core process of SRL also suggests that SRL researchers should do more to consider individual differences linked to time or time use (Aeon and Aguinis 2017; Francis-Smythe and Robertson 1999b). Chronotype, polychronicity, and future time perspective, as just three prime examples, represent time-related dispositions that should be explored further as potential influences on SRL. Thought to derive from biological or neurological differences tied to circadian rhythms, chronotype reflects students' preferences for when during the day (e.g., morning vs. evening) they like to be active and engaged in cognitive work (Hahn et al. 2012; Loureiro and Garcia-Marques 2015). Polychronicity describes people's predilection for wanting to devote their cognitive resources to a single activity until it is complete versus preferring to multitask (Capdeferro et al. 2014; Konig and Waller 2010; Schell and Conte 2008). Future time perspective (Husman and Lens 1999; Kooij et al. 2018; Zimbardo and Boyd 1999) is a multifaceted construct that, in part, reflects the extent to which individuals perceive a connection to the future and are habitually motivated by goals that are more temporally distant (e.g., college graduation, retirement) versus objectively closer in time (e.g., weekend plans).

Already, researchers have linked each of these time-related individual differences to a range of relevant outcomes including executive functioning, motivation, job performance, personal well-being, and academic success (Gulec et al. 2013; Horstmannshof and Zimitat 2007; Kantrowitz et al. 2012; Shell and Husman 2001; Simons et al. 2004). Further, researchers have demonstrated relationships between chronotype, polychronicity, and future time perspective with procrastination, time use, and aspects of time management (Díaz-Morales et al. 2008; Ferrari and Díaz-Morales 2007; Kauderer and Randler 2013; Kaufman-Scarborough and Lindquist 1999; Sirois 2014). There is also some evidence that indicates each may be useful for understanding students' SRL more generally (Miller and Brickman 2004; Shell and Husman 2001). Although quite limited, the existing research examining these individual differences illustrates the potential that these, and other time-related dispositions, have for understanding college students' SRL and ultimate academic success. Studies that more thoroughly evaluate these or other time-related personal characteristics and the particular mechanisms through which they might influence students' time management and SRL more broadly are needed. It would be helpful to know, for instance, if the effectiveness of training in time management or SRL is moderated by individual differences in students' chronotype or future time perspective.

Social and Cultural Factors

Researchers have identified a number of social and cultural influences on students' SRL (McInerney and King 2018; Schunk and Zimmerman 1997; Wolters 2011). For instance, students' exposure to appropriate models affects their development of the values, beliefs, knowledge, and skills that are essential to SRL (Schunk and Zimmerman 1997; Wolters 2011). Although modeling also can be useful for improving students' time management, greater insight into the types of models and how specific aspects of the time management process can be learned through modeling would be useful. As an example, the role that parents and teachers might play in the acquisition of the beliefs and strategies necessary for time management would provide useful insights into how this process develops. In addition, effective collaborative groups must be able to manage jointly the time and effort they devote to different tasks (Gevers et al. 2006). Hence, studies examining time management as an aspect of effective group functioning and, more specifically, as a target for socially shared self-regulation would likely provide valuable insights (Hadwin and Oshige 2011; Xu et al. 2013).

Greater appreciation of time management as a self-regulatory process also points to additional social and cultural factors that researchers should examine as potential influences on SRL. For example, there are noteworthy variations in how particular cultures perceive time, the use of time, and the need for time management (Konig and Waller 2010; Meeuwisse et al. 2013; Nonis et al. 2005). Further, some have viewed time itself as a social construction that is impacted by students' sense of self and sociocultural context (Duncheon and Tierney 2013). That is, students' cultural background, social identity, and self each may affect their understanding of time including whether, how, and to what end they deliberately manage the amount of time they devote to academic work. In short, greater integration of time management into models of SRL provides a pathway through which sociocultural factors might impact students' engagement, learning, and achievement. As an example, it might be that cultural factors that influence students' regulation of their time also constrain the extent to which they are plan-full about the cognitive and metacognitive strategies they use while learning.

Instructional Context

An assumption common to most models of SRL is that the beliefs, attitudes, and abilities necessary to engage effectively in SRL are responsive to instruction (Schunk and Zimmerman 1998). Research demonstrating the efficacy of training people, including college students, to improve their time management is consistent with this assumption (Claessens et al. 2007; Green and Skinner 2005; Hafner et al. 2014). Despite this background, studies that address two key questions about instruction, time management, and SRL are needed. One, more research is needed to understand the specific teaching methods that are most effective in improving the various aspects of college students' time management. For instance, using some sort of time log activity to teach students how to monitor and reflect upon their use of time is a common activity used to improve college students' time management (Hofer et al. 1998). Yet, many more focused questions about how this type of exercise might best be structured (e.g., how many days of logs, what type of reflection prompts) in order to maximize its overall effectiveness remain untested. That is, researchers need to move beyond showing that time management training programs are effective to understanding what exactly makes them effective, and how those features can best be taught to students. Studies that focus on particular

instructional interventions and include random assignment to conditions would do much to advance this work.

Two, studies are needed to examine how the more general procedures, policies, and practices associated with an instructional context impact student's time management with regard to that context. Several strands of research have demonstrated that the climate, culture, or typical instructional practices within a classroom are associated with both students' motivation and their use of self-regulation strategies (Ames 1992; Urdan and Schoenfelder 2006; Wolters and Gonzalez 2008). There also is limited evidence that certain instructional practices (e.g., use of deadlines; testing) relate to students' academic procrastination or use of time (Soderstrom and Bjork 2014; Wolters and Hoops 2015). More generally, the time-related structures, norms, or practices within a particular environment might serve as an important influence on individuals' time management behaviors (Aeon and Aguinis 2017; Burt et al. 2010). Still, research examining how general instructional practices or facets of the instructional environment may relate to the beliefs and skills that are relevant to time management is quite limited. For example, it is uncertain how rigid deadlines, visual reminders, verbal check-ins, or other instructional practices associated with completing assignments promote or hinder students' self-regulation of their time. As well, it is unclear whether, and if so how, greater autonomy support, cohesion, structure, or other recognized aspects of the classroom climate promote students' regulation of when and for how long they engage in academic tasks completed outside the classroom. Similarly, although researchers have tied characteristics of the task, grouping, and evaluation to students' adoption of achievement goals in younger students (Ames 1992), it remains an open question as to whether these same factors might influence college students' time management. Expanding this work with designs that allow stronger causal conclusions should provide insights into how best to improve students' time management proficiency and its development across academic levels through the more routine features of an instructional context (i.e., not interventions that target time management directly).

Student Risk Factors

As with SRL more generally, effective time management may be within the grasp of most students. Certain groups of students, however, might be at greater risk for issues arising from poor time management or might benefit more substantially from interventions that increase their effective management of time. One such group might be those who face greater and more complex demands on their time such as student-athletes, students with a job, or students who care for a dependent. Among community college students, for example, time management was a weaker predictor of grades for those enrolled full-time than for those who were enrolled part-time and who presumably had more outside demands on their time (MacCann et al. 2012). If students with these types of increased time commitments are unable or unwilling to manage their time well, the increased pressure on their time might put them at greater risk of academic or personal difficulties that can come from the misappropriation of time. As well, students who are inexperienced with contexts characterized by low structure or increased autonomy also might be at increased risk due to poor time management. As an example, first-year students who come from a more adult-structured home environment might have difficulty managing all the new demands and opportunities to spend their time. Although poor time management provides one explanation for why academic performance and retention among students with increased time commitments or less experience in autonomy demanding contexts tend to fall

below those of their peers (e.g., van der Meer et al. 2010), this premise needs to be examined empirically, including questions about which aspect(s) of time management might be most pivotal. For instance, it is not clear if these students lack the knowledge and experience for managing their time effectively, if they do not recognize the positive effect that time management can have on their learning and achievement, or if they have lacked the opportunities necessary to develop these skills. Studies in which researchers work to tease apart whether, and if so why, certain groups of students (e.g., those caring for a dependent) may have difficulty with time management should provide insights that could be used to ameliorate the academic struggles that many students from these groups face.

Developmental Patterns

Our discussion of time management and SRL has focused on college students because of its recognized salience, practical importance, and the amount of prior research with this population. Although post-secondary settings are ripe for investigating these processes, there also are good reasons for examining time management among younger students. Many adolescents are “overscheduled” and the pressure, anxiety, and lack of free time may lead to serious consequences for their academic performance and personal well-being (Hilbrecht et al. 2008; Wagner et al. 2008). There is ample evidence that secondary students’ time management, or some aspects of it, can be assessed reliably (Duncan and McKeachie 2005; Liu et al. 2009; MacCann and Roberts 2010; Tsai and Liu 2015; Xu 2008). There also is limited evidence that time management is associated positively with school grades within this population (Haynes et al. 1988; Liu et al. 2009; MacCann and Roberts 2010). It seems reasonable to suppose that adolescents’ emerging ability to understand and reason about abstract concepts such as time and their personal future (see Keating 2012) might be tied to changes in their use of time management strategies. These cognitive abilities, which do not develop until later in adolescence for some, might provide a limit on students’ involvement in certain aspects of time management. Hence, understanding the roots and developmental progression of the beliefs, attitudes, knowledge, and skills that serve as the foundation for students’ time management would aid researchers and educators alike. In particular, insights about when and how particular strategies tend to emerge and how these changes are a function of improved cognitive abilities could be instrumental in developing instructional interventions design to promote effective time management.

Overall, our brief discussion in this section illustrates several individual, sociocultural, and instructional factors viewed as influences or antecedents to students’ time management and SRL. These commonalities strengthen the argument that time management is a core self-regulatory process that contributes to college students’ overall SRL. In addition, it also is apparent that researchers have examined some of these factors more exclusively with regard to just time management or just SRL, but not both. Hence, there are many lines of research that can be pursued to provide a more comprehensive understanding of the antecedents that promote students’ time management and SRL.

Concluding Comments

Among college student populations, the importance of time management is supported by its association with reduced procrastination, increased academic performance, and improved

personal well-being (Basila 2014; Britton and Tesser 1991; Burlison et al. 2009; Crede and Phillips 2011; Kitsantas et al. 2008; Macan et al. 1990; Trueman and Hartley 1996; Wolters et al. 2017). Further, time management is a target of the most commonly provided interventions for post-secondary students (Truschel and Reedy 2009; Young and Hopp 2014). Despite this background, much of the research investigating time management has proceeded in the absence of a comprehensive conceptual model that can be used to understand college students' academic engagement, learning, and achievement (Claessens et al. 2007). Our principal goal was to demonstrate that SRL provides the rich theoretical framework necessary for understanding and guiding research on college students' time management. After reviewing work to establish the significance of time management, we advanced this goal in three major sections. First, we summarized the extant empirical research linking time management with the motivational and regulatory processes most representative of SRL. This review indicated that, although fairly limited and with some key shortcomings, previous findings are in line with theoretical expectations. That is, evidence of students' engagement in effective time management tends to be associated positively with indicators of more adaptive motivation and with increased use of other self-regulatory strategies. Second, we evaluated conceptual consistencies between key processes of SRL and time management. This evaluation demonstrated the substantial interdependence and commonalities among the foundational processes of SRL and time management. Third, we identified similarities among the antecedents or contextual influences associated with SRL and time management. By highlighting their shared etiology, this effort substantiated further the efficacy of using SRL as a framework for understanding and guiding research on students' time management. Within each of these sections, we identified potential lines of research that would contribute to a greater understanding of time management, its fit within the framework of SRL, and its relationship to college students' academic success.

In sum, the contribution of the present article is to establish that SRL provides a comprehensive and effective guiding framework necessary for investigating time management and its relationships to other factors that together determine college students' academic learning and achievement. Within this framework, time management encompasses the various forethought, performance, and post-performance processes through which students self-regulate when and for how long they engage in the activities deemed necessary for reaching their academic goals. This understanding fits well with prominent views of SRL (Boekaerts 1996; Efklides 2011; Pintrich and Zusho 2007; Winne 1995; Zimmerman 2000) and is in line with prior definitions of time management (Claessens et al. 2007; Koch and Kleinmann 2002). Further, it provides a solid foundation for guiding both theoretical research and for developing interventions designed to improve college students' time management and SRL.

Although this contribution is noteworthy, we close with two important caveats. One, it is worth noting that time management should be considered part of SRL for students at all academic levels. We elected to focus our discussion on post-secondary students because they tend to have greater autonomy over their own schedules while also faced with increased demands on their time. As well, much of the prior work in which researchers examined time management and its connection to academic performance has been conducted with this population. As noted above, however, there is increasing concern over the time pressures faced by younger students (Hilbrecht et al. 2008; Won and Yu 2018; Shaunessy-Dedrick et al. 2015), and better understanding the developmental roots of both time management, its links to SRL, and its relationships to important indicators of academic success and well-being will necessarily involve investigations of younger students.

Two, it is important to keep in mind that time management is just one dimension within a larger complex system of SRL that also is dependent on students' motivation and use of other types of self-regulatory strategies. Researchers and practitioners should not interpret our call for increased attention to time management as a claim that more commonly studied aspects of SRL are unimportant. On the contrary, time management most fundamentally accounts for students' arrangement of sufficient periods of time in which they can be completing academic work. As with other types of strategies, however, students' strategic management of their time might never get initiated if they are not sufficiently motivated. As well, even though greater time devoted to academic work generally is associated with increased performance (Doumen et al. 2014; Dunlosky and Ariel 2011; Landrum et al. 2006; Plant et al. 2005; Witkow 2009), effective time management does not guarantee that students will spend their time productively or in ways that will result in meaningful learning. Regardless of when or how long students set aside for the completion of academic tasks, that is, these efforts may not lead to greater achievement if the quality of their engagement or motivation for learning is lacking (Plant et al. 2005). Hence, the allocation of sufficient study time through effective time management can best be viewed as a necessary but insufficient dimension to a productive system of SRL. As we have argued throughout this article, however, time management is a dimension that has been underappreciated given its significance within this broader system of SRL and to academic success.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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