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The relationship between self-control and procrastination based on the self-regulation theory perspective: the moderated mediation model

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Abstract
The self-regulation theory suggests that self-monitoring is a crucial factor in the progress of goal pursuit. Based on this theory, we explored the influence and mechanism of time management disposition and self-monitoring in relation to procrastination. In the study sample of 503 Chinese college students, we found that procrastination was negatively correlated with time management disposition and self-control, time management disposition was significantly and positively correlated with self-control, and self-monitoring was not significantly correlated with the other variables. Time management disposition was found to play a partially mediating role between self-control and procrastination, whereas indirect relationship between self-control and procrastination through time management disposition was moderated by self-monitoring, namely, self-monitoring moderated the effect of time management disposition on procrastination. The results of this study suggest that self-monitoring can strengthen or weaken the inhibition effect of self-control on procrastination thought time management disposition.

Keywords Procrastination · Self-control · Time management disposition · Self-monitoring · Self-regulation theory

Introduction

There is no more common phenomenon than work and academic procrastination (Baran et al. 2018; Garzón-Umerenkova and Gil-Flores 2017). Procrastination means to voluntarily delay an intended course of action despite expecting to be worse off for the delay (Steel 2007). It is exhibited occasionally, regularly, or persistently by 80% to 95% of college students (Ellis and Knaus 1977; O'Brien 2002), and approximately 50% of them indulge in continual procrastination (Rozental and Carlbring 2014). Many studies have demonstrated that procrastination is associated with certain kinds of negative consequences, especially among students. From a standardized interviews with university students, researchers used qualitative content analysis and frequency analysis to find that procrastination affects students' private lives (Grunschel et al. 2013), people high in procrastination entertain low achievement (Grund and Fries 2018). A review of procrastination revealed that it is recognised in the poor health behaviour (Kroese and Ridder 2015). Blunt and Pychyl (2000) explored notions of task aversiveness across stages of personal projects and found that procrastination increased stress, which lead poorer academic performance (Goroshit 2018). Although procrastination can cause lots of difficulties to those who afflicted, research concerning prevention and interventions for procrastination is currently scarce. Many factors that are typically associated with general procrastination. In a sample of 178 college students in Switzerland, researchers find that extraversion and

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neuroticism are related to active procrastination (Kim et al. 2017b). Xie et al. (2018) adopted meta-analysis to explore the relationship between procrastination and multidimensional perfectionism and indicated that perfectionistic strivings were negatively linked to procrastination, whereas perfectionistic concerns were positively linked to procrastination. So far, the influential factors and causes of procrastination are still the hot spot of researchers' concern.

Why do people procrastinate? It is known that procrastination is a failure of self-regulation (Idit 2018; Steel 2007). People control their behavior through self-regulation (Bandura 1991). Self-regulation refers to one' s ability to control one' s own behaviors, feeling, and thoughts, which plays a significant role in human behaviors. People can hardly recognize and then control their eating, drinking, working, speaking, and thinking without self-regulation. In addition, not only behaviors and thoughts but also cognition and emotion are involved in self-regulation. Based on the self-regulation theory, self-regulation is conceptualized as having four components: standards, motivation, monitoring, and willpower, and every ingredient matters, however, one may be compensated or substituted by others to some degree (Baumeister et al. 2007a). It is self-regulation that ensures the completion of plans, the focus of attention on goals, the inhibition of impulses, and the regulation of behaviors (Baumeister et al. 1994; Vohs and Baumeister 2004). As a motivational factor in self-regulation, individuals with high avoidance motivation have a lower dropout rate from a bonus-granting longitudinal study and reduce procrastination in submitting papers (Schödl et al. 2018), which shows that avoidance motivation protect people from harm and procrastination effectively. At the same time, higher willpower will also compensate for psychological resource consumption, effectively reducing individuals' procrastination (Job et al. 2010). Overall, self-regulation can significantly negatively predict academic procrastination. Individuals with good self-regulation can choose appropriate learning strategies according to their own learning progress (Ziegler and Opdenakker 2018) so that they can improve self-efficacy as the goal of self-adjusting intervention measures and prevent or reduce graduate academic procrastination (Zhang et al. 2018; Grunschel et al. 2018). Thus, self-regulation plays an important role in the generation and development mechanism of procrastination.

Since improving individuals' self-regulation enables them to avoid procrastination, how can we improve self-regulation? Self-regulation puts self-control at the core of the process. Self-control is considered to be an important manifestation of self-regulation, which is the capacity to intentionally modify one' s own response tendency to pursue a specific goal and restrain other tendencies for greater long-term utility (McCullough and Willoughby 2009). Self-control is considered a deliberate and conscious subset of regulation (Baumeister et al. 2007b), including suppressing thoughts, regulating emotions and impulses, and altering performances (Baumeister 2002). People vary in the amount of self-control resources the ability to govern them (Freeman and Muraven 2010). It is difficult to transform one' s intention into action when individuals do not have enough self-regulating resources. A study found higher instances of addiction to Facebook in individuals with low self-control because they lack the ability to resist an impulse or a temptation, among other reasons, and are more likely to become addicted to Facebook (Błachnio and Przepiorka 2016) due to their lower control when intention is transformed into action. The effective exertion of self-control contributes to success in various aspects of life. Higher self-control was positively related with higher grades, better psychological adjustment, and better interpersonal relationships (Tangney et al. 2004). In addition, self-control is a negative predictive factor of procrastination, which has been demonstrated by empirical studies (Digdon and Howell 2008; Luczynski et al. 2014). When someone begins a task, if he/she does not have enough psychological resources and motivation to complete it due to the lack of self-control, there will be a delay in the time needed to finish the work (Geng et al. 2018). The most common outcome in this case is to go to bed late (Kühnel et al. 2018).

In fact, most procrastinators often find it hard to follow their schedules because of the lack of self-control, which suggests that time management may serve as a mediator. Time management disposition, as a multidimensional and multilevel personality characteristic regarding the person's approach to using and managing time, comprises a sense of time value, time control, and time efficacy (Huang and Zhang 2001a). Time management disposition has been found to positively predict both work performance and learning performance and negatively predict procrastination (Oettingen et al. 2015). In a survey of students' academic procrastination, Won and Yu (2018) found that time management can help students eliminate procrastination and improve their academic performance. In addition, it is found that network self-control can significantly positively predict time management disposition (Sun et al. 2015). According to the strength model of self-control (Baumeister et al. 1994), the total amount of psychological resources is limited. When self-control efforts in one field consume energy, the energy that can be obtained in the resource pool in other fields will decrease correspondingly. Therefore, individuals with lower self-control have fewer resources to allocate their perception of time, so they have a lower tendency to practice time management and can be said to lack self-control to manage their time. As previous studies have shown, self-control is associated with individual personality traits (Tittle et al. 2004), and time management disposition is the representative of personality characteristics in time management (Huang and Zhang 2001a). Due to the low self-control, It is difficult for individuals to manage and allocate time effectively, so they are unable to complete tasks within

the prescribed time, showing procrastination. Therefore, time management disposition may mediate the inhibiting effect of self-control on procrastination.

Most theories regard intention as a key factor in determining behavior (e.g., Ajzen 1991; Gibbons et al. 1998); however, procrastination, as the representation of the failure of self-regulation and the reflection of the intention-action gap, shows that the obstacles between intention and behavior also play a significant role (Steel 2007). Baumeister and his colleagues (Baumeister et al. 2007a, b) pointed out that people with better self-regulation tend to avoid underachievement because they have better abilities to set and reach goals, suppress impulses, adjust emotions, and delay gratification. These abilities could effectively reduce the intention-action gap, which is the crucial factor of preventing procrastination. Every component of self-regulation is important; however, one may be compensated or replaced by others to some degree (Baumeister and Vohs 2007). In this way, procrastination could be reduced by improving self-regulation in the monitoring aspect, which is known as self-monitoring and refers to the ability of an individual to adjust his or her behavior according to external situational factors (Snyder 1979). There is always a process of self-observation and awareness before self-regulation, which is the main content of self-monitoring and determines the subsequent behavior.

Self-monitoring is a concept of metacognition category (Dai et al. 2017) with the essential differences of self-control and time management disposition, which relate to concepts of capacity category. In the psychological sense, self-control is seen as being less flexible in adapting acts to meet new situational demands and a limited capacity for delay and waiting (Kopp 1982). In contrast, self-monitoring is considered to be adaptive to changes. It is an ability of individuals to adjust their behaviors according to external situational factors and presumably implicates the use of reflection and strategies involving introspection, consciousness, or metacognition. Some existing studies support the relative independence of self-monitoring. For instance, Nottebohm and Arnold (1976) suggested that self-monitoring has no connection with personality in various dimensions. Exactly as the existing study found, high self-monitoring individuals do not appear to control themselves better than low self-monitoring individuals (Felfe and Schyns 2002), which supports the independence of self-monitoring and self-control. Consequently, self-monitoring could be considered an ideal moderating variable due to its relative independence. Harkin et al. (2016) reviewed goal progress monitoring and found that self-monitoring frequently serves as an impetus to behavior change. In addition, the attention to assignment-related and environmental requirements, which is triggered by a high level of self-monitoring, may provide more contextualization cues for the rational allocation of time resources and the use of efficient time management strategies. A study of 96 students who did not differ in academic performance and learning habits found that those who received self-monitoring, self-reward and planning strategy training performed significantly better than those who did not receive training in almost all tests, indicating the effectiveness of self-monitoring in learning (Greiner and Karoly 1976). Therefore, self-monitoring may facilitate more rational time management strategies to accelerate the assignment progress, thereby reducing procrastination. Even then, the influence of time management disposition on specific behaviors, such as procrastination, will be moderated by individuals' internal state and external requirements of tasks. For example, when tasks are important and urgent, more time will be invested to ensure that tasks are completed on time. However, time management disposition is also considered as a stable personality trait (Huang and Zhang 2001a). Therefore, the influence of self-control on individual time management disposition will not change greatly due to individuals' attention to internal and external cues.

Current Study

Self-control provides resources for individuals to change their behaviors after they regulate the strategies. According to the strength model of self-control (Baumeister et al. 1994), the total amount of psychological resources is limited. With low self-control, the resources individuals will allocate in work or study will be reduced if they are unable to control themselves to put resources into work or study, and the time management and allocation of resources will also be reduced, causing a decline in time sensitivity and eventually resulting in procrastination. Recent literature has indicated that the generation of procrastination is affected by self-regulation. Four factors of self-regulation are standard, motivation, monitoring and willpower, and they affect each other and play an important role in the generation and influence mechanism of procrastination. Self-monitoring, as the controlling factor of the inner psychological process, is helpful for planning and reflecting before the behavior comes into being. Early work provided empirical evidence that students who received the self-monitoring task performed better in both academic performance and academic behavior (Sagotsky et al. 1978). At the same time, the ability to practice time management has indirect effects on health and job satisfaction through perceived control (Adams and Jex 1999). Nevertheless, a lack of self-control resources may reduce the allocation of resources in other activities, such as reducing the time allocation in tasks. During this time, self-monitoring can help individuals make internal judgments in thought and perception, choose appropriate coping strategies and make up for the loss caused by uncontrollable behaviors. Therefore, proper and effective self-monitoring can slow down the negative behaviors caused by time management failure.

On the basis of the aforementioned studies, we proposed the following hypotheses:

- Hypothesis 1: Time management disposition may mediate the inhibiting effect of self-control on procrastination.
- Hypothesis 2: Self-monitoring moderates the relationship between time management disposition and procrastination, specifically, self-monitoring may strengthen the negative effect of time management disposition on procrastination.

Method

Participants

The participants were 503 students (256 men, 247 women) between the ages of 17 and 22 years ($M = 19.91$, $SD = .967$) selected by random cluster sampling from the universities in China. They volunteered to complete self-report questionnaires for this study. Prior to testing, the examiner read the instructions and explained the principle of confidentiality. Informed consent was provided by all the participants. Approximately 15 min was required by each student to complete all items. This research (the study title XXXs) was approved by the ethics committee at [blinded], and informed consent was provided by all the participants.

Measures

Aitken's Procrastination Inventory (API) The API was compiled by Aitken (1982) and translated by Chen et al. (2008). This single-dimension self-rating inventory consists of 19 statements, and procrastination is measured by rating the statements from very agree to very disagree on a 5-point scale. The responses across the 19 items were summated as the total score of procrastination. Potential scores of API range from 19 to 95, and a higher score indicates more procrastination. We also conducted confirmatory factor analyses (CFA) to verify these coping strategies as unique dimensions. By most model fit indices, the CFA supported the model fit indices: $\chi 2/df = 2.903$, $IFI = .903$, $CFI = .902$, $RMSEA = .062$). In the present study, the Cronbach's alpha was .855.

Self-Control Scale (SCS) The SCS was compiled by Tangney et al. (2004) and revised by Tan and Guo (2008). The scale uses a 5-point scale and has 19 items including five dimensions: impulse control, healthy habits, resisting temptation, dedication, and moderation in entertainment, and responses across the 19 items were summated, with higher scores indicating stronger abilities of self-control. In this study, the total score of self-control had high correlations with the five dimensions ($r = .759$, .689, .756, .693, and .718, respectively). The CFA supported the five proposed coping strategies as unique latent dimensions (model fit indices: $\chi 2/df = 2.539$, $IFI = .909$, $CFI = .908$, $RMSEA = .055$). In the present study, the Cronbach's alpha was .843.

Time Management Disposition Scale (TMDS) The TMDS was compiled by Huang and Zhang (2001b) and is suitable for evaluating how young adults subjectively experience and use time. A 5-point Likert rating scale was employed to evaluate the scores. A total of 44 items made up three subscales, namely, sense of time value (10 items), sense of time control (24 items), and sense of time efficacy (10 items), and responses across the 44 items were summated, with higher scores indicating higher levels of time management disposition. The CFA supported the model fit indices: $\chi 2/df = 1.991$, $IFI = .902$, $CFI = .901$, $RMSEA = .042$. In this study, the total score of time management disposition had high correlations with the three subscales ($r = .583$, .934, and .812, respectively), and the total Cronbach's alpha was .898.

Self-Monitoring Scale (SMS) The SMS was compiled by Snyder (1974) and revised by Li et al. (1992). It has 25 items and uses a 2-point scale (Yes = 1 or No = 0). The responses across the 25 items were summated, with higher scores indicating higher levels of self-monitoring (model fit indices: $\chi 2/df = 1.921$, $IFI = .905$, $CFI = .901$, $RMSEA = .043$). In this study, the total Cronbach's alpha was .70.

Common Method Biases

Firstly, common variance analysis was applied to the four questionnaires through factor analysis. The chi-square of Bartlett's test of sphericity reached significance. After principal component analysis, 29 eigenvalues greater than 1 were extracted. The first factor to explain the variance was 14.107%, which was less than the 40% required by the critical standard. Consequently, these tests suggest that common method bias is not a major concern in this study (Podsakoff et al. 2003).

Statistical Analyses

All statistical analyses were performed using SPSS Version 22.0.

Results

Descriptive Statistics and Correlation Analysis

The means, standard deviations, and correlation matrix for procrastination, self-control, time management disposition,

and self-monitoring are presented in Table 1. Procrastination was negatively correlated with time management disposition and self-control. A significant positive correlation between time management disposition and self-control was observed, while self-monitoring was not significantly correlated with the other variables.

The Mediating Effect of Time Management Disposition

Figure 1 shows the total effect of self-control on procrastination (*total effect* = −.501, SE = .039, t = −12.951, p < .001, 95% CI = −.577 to −.425) using Model 4 of the PROCESS macro v3.0 for SPSS (Hayes 2013).

Figure 2 introduces the standardized coefficients, which allow for the testing of the hypotheses that concern the mediating effect of time management disposition. Procrastination was entered as the outcome variable, and self-control was entered as the predictor variable. A partial least squares algorithm was used to estimate the path coefficients, and their significance was tested by conducting bootstrapping on 5000 samples to reduce the effects of random sampling errors. The model explained 36.6% of the variance of time management (F (1,501) = 77.474, R^2 = .366, p < .001) and explained 33.9% of the variance of procrastination (F (2,500) = 128.027, R^2 = .339, p < .001). Self-control was a significant predictor of time management disposition (β = .366, SE = .042, t = 8.802, p < .001, 95% CI = .284 to .448) and procrastination (β = −.384, SE = .039, t = −9.832, p < .001, 95% CI = −.461 to −.307). Time management disposition was a significant predictor of procrastination (β = −.319, SE = .039, t = −8.151, p < .001, 95% CI = −.395 to −.242). The indirect effect of self-control on procrastination through time management disposition was negative and significant at a 95% confidence interval (*indirect effect size* = −.117, SE = .021, 95% CI = −.161 to −.078). By controlling the mediators, the direct effect of self-control on procrastination was significant (*direct effect size* = −.384, SE = .039, t = −9.832, p < .001, 95% CI = −.461 to −.307), indicating partial mediation of time management disposition in the relationship between self-control and procrastination. These results fully supported hypothesis 1.

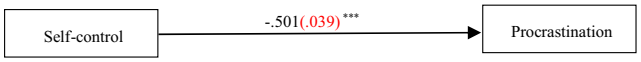

Fig. 1 Total effect model. Path values are the path coefficients. *Note:* Path values are the path coefficients (standard errors). *** p value < .001

The Moderated Mediation Model Test

This study followed the bootstrapping procedures suggested by Hayes (2013) since bootstrapping provides higher statistical power and more accurate solutions for the testing of indirect effects than other methods, such as Baron and Kenny's (1986) procedures and Sobel's (1982) test (Hayes 2013). We used Model 14 PROCESS macro for SPSS developed by Hayes (2013) to evaluate the moderated mediation model. Some recent studies have applied this data analysis method to moderated mediation analyses (e.g., Curran 2018). The model explained 13.4% of the variance of time management (F (1,501) = 77.474, R^2 = .134, p < .001) and explained 35.4% of the variance of procrastination (F (4,498) = 68.135, R^2 = .354, p < .001). The indexes of moderated mediation were − .041, SE = .015, 95% CI = −.069 to −.011, which is different from zero. Thus, it leads to the expectation that an indirect effect is moderated. Having examined the moderating effect of self-monitoring, the results revealed that self-monitoring did not significantly predict procrastination (β = −.053, SE = .036, t = −1.457, p = .146, 95% CI = −.124 to .018). The significant negative interaction of self-monitoring and time management disposition indicated that self-monitoring negatively moderates the effect of time management disposition on procrastination (β = −.113, SE = .036, t = −3.170, p = .002, 95% CI = −.183 to −.043). As depicted in Table 2 and Fig. 3, self-monitoring strengthens the negative effect of time management disposition on procrastination, which supports hypothesis 2. The results showed that the mediation of the degree of time management disposition in the effect of self-control on procrastination depends on one' s self-monitoring, which supports the hypothetical moderated mediation model.

To clearly show the increasing trends of the correlation of time management disposition and procrastination, we examined this interaction using a simple slope analyses and drew all these relationships at three different levels of self-monitoring (see Fig. 4, self-monitoring = M-1SD, M, and M + 1SD) according to the existing research (Curran 2018). The simple slope analyses found that with the improvement of self-monitoring, time management disposition enhances the prediction

Table 1 Descriptive statistics and related analysis results of the variables (N = 503)

Variable	M	SD	1	2	3	4
1 Procrastination	48.10	9.44	1			
2 Self-control	60.17	10.00	−.501***	1		
3 Time management disposition	147.10	17.43	−.459***	.366***	1	
4 Self-monitoring	12.37	4.26	−.040	−.021	.010	1

*** p < .001, similarly hereinafter

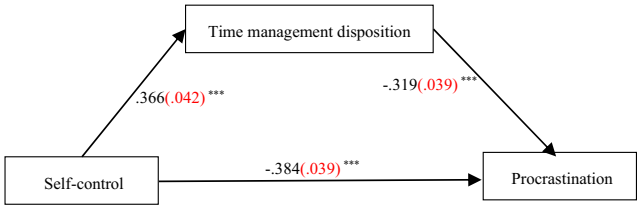

Fig. 2 The mediating effect model. *Note:* Path values are the path coefficients (standard errors). *** p value < .001

of procrastination (low level of self-monitoring: $\beta = -.196$, SE = .054, $t = -3.607$, $p < .001$, 95% CI = −.303 to −.089; medium level of self-monitoring: $\beta = -.309$, SE = .039, $t = -7.966$, $p < .001$, 95% CI = −.385 to −.233; high level of self-monitoring: $\beta = -.422$, SE = .051, $t = -8.303$, $p < .001$, 95% CI = −.522 to −.322).

The bias-corrected bootstrap confirmed that the indirect relationship between self-control and procrastination through time management disposition was moderated by self-monitoring. To be specific, with the improvement of self-monitoring, the indirect effect was stronger (low level of self-monitoring: $\beta = -.072$, SE = .025, 95% CI = −.128 to −.029; medium level of self-monitoring: $\beta = -.113$, SE = .021, 95% CI = −.156 to −.076; high level of self-monitoring: $\beta = -.154$, SE = .025, 95% CI = −.207 to −.108). The results support the hypotheses developed in this research.

Discussion

The total effect model revealed that self-control is a significant predictor of procrastination. In other words, a low degree of self-control correlated with a high level of procrastination, which was consistent with the results of previous studies (Luczynski and Hanley 2013; Kim et al. 2017a). On the one hand, a lack of self-control will reduce the individual' s expectation of success and behavioral motivation to change the status quo and eventually cause procrastination behavior (Haycock et al. 1998). On the other hand, according to the strength model of self-control, individuals with low self-control lack the necessary self-regulating resources to put their willpower into action and are more likely to procrastinate when completing a task. In addition, individuals with low self-control are easily distracted and tempted by irrelevant tasks, leading to difficulty in task execution, which is also one of the reasons that they are prone to procrastination.

Consistent with hypothesis 1, the mediation effect model showed that time management disposition partially mediated the effect of self-control on procrastination. In other words, self-control could positively predict time management disposition, and time management disposition could negatively predict procrastination. Individuals with low self-control have a lower tendency toward time management, resulting in procrastination, which supports extant studies and the self-regulation theory. These individuals do not have enough psychological resources to maintain the motivation and willpower necessary to complete the task, which reduces the disposition of time management and leads to procrastination. An existing study has revealed that people with poor self-control always have poor time management abilities (Bertrams et al. 2010). Becker and his colleagues suggested that there were significant differences in resource allocation strategies between participants with low and high self-control and a significant decline in attentional resource allocation among the low self-

Table 2 Testing the total effect model and the moderated mediation model

Path	standardized regression coefficient	SE	95% CI
Conditional mediation effect model			
self-control→procrastination	−.383***	.039	[−.459, −.307]
self-control→time management disposition	.366***	.042	[.284, .448]
time management disposition→procrastination	−.309***	.039	[−.385, −.233]
self-monitoring→procrastination	-.053ns	.036	[−.124, .018]
self-monitoring × time management disposition →procrastination	−.113**	.036	[−.183, −.043]
time management disposition→procrastination | self-monitoring = −1 *SD*	−.196***	.054	[−.303, −.089]
time management disposition→procrastination | self-monitoring = 0 *SD*	−.309***	.039	[−.385, −.233]
time management disposition→procrastination | self-monitoring = +1 *SD*	−.422***	.051	[−.522, −.322]
self-control→time management disposition→procrastination | self-monitoring = −1.5 *SD*	.101	.072	[−.016, .275]
self-control→time management disposition→procrastination | self-monitoring = −1 *SD*	−.072	.025	[−.128, −.029]
self-control→time management disposition→procrastination | self-monitoring = 0 *SD*	−.113	.021	[−.156, −.076]
self-control→time management disposition→procrastination | self-monitoring = +1 *SD*	−.154	.025	[−.207, −.108]
self-control→time management disposition→procrastination | self-monitoring = +1.5 *SD*	−.155	.080	[−.337, −.020]

ns non-significant, ** p value < .01, *** p value < .001

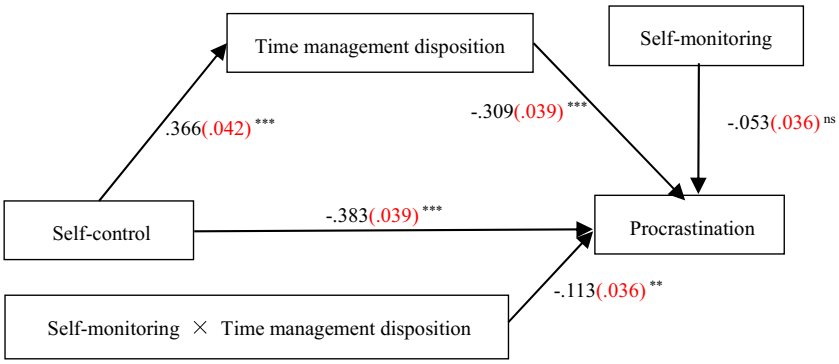

Fig. 3 Moderated mediation model. *Note:* Path values are the standardized regression coefficients (standard errors). ns non-significant, ** p value < .01, *** p value < .001

control group during periods of vigilance or sustained attention (Becker et al. 2015). Thus, high self-control could benefit from effective attentional resource allocation, which could help individuals invest considerable time and attention in the task and manage time effectively, further increasing their time management disposition. Additionally, we found that time management tendencies could negatively predict procrastination. This result was also consistent with the results of research on arousal and avoidant procrastination (Tian and Deng 2011) and research on academic procrastination (Jou et al. 2014). Individuals with a lower level of time management disposition always fail to manage time properly, which causes them to miss deadlines. The existing research suggests that a lower level of time management disposition could cause an increase in negative emotions such as anxiety (Macan 1994). To relieve such anxiety, individuals may choose to escape the task, which could eventually trigger procrastination.

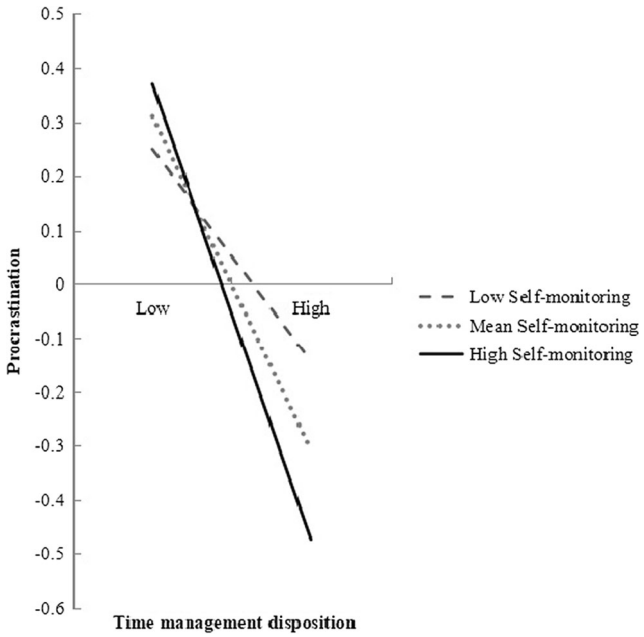

Fig. 4 The moderating effect of self-monitoring on the relationship between time management disposition and procrastination. *Note:* High and low levels of self-monitoring were created using a plus and minus one standard deviation from the mean, respectively, and medium self-monitoring was the mean of self-monitoring

In addition, the moderated mediation model indicates that self-monitoring enhances the effect of time management disposition on procrastination, supporting hypothesis 2. Specifically, for individuals with higher levels of self-monitoring, time management disposition can reduce procrastination much more effectively. Time management disposition is the cognitive trait underlying individuals' attitudes, planning, and use of time (Fan et al. 2012). The result of the moderated mediation model showed that the mediation of time management disposition in the effect of self-control on procrastination depends on the level of self-monitoring. According to the self-regulation theory, individuals with low self-control have lower willpower and motivation to complete work, leading to lower time management disposition. However, such a deficiency can be remedied by monitoring. In other words, self-monitoring enhanced the inhibiting effect of self-control on procrastination by strengthening the negative relationship between time management disposition and procrastination. On the one hand, time is one of the most important resources, and its reasonable distribution needs to be guided by important information and clues, such as the internal and external environment clues considered by individuals with high self-monitoring. High self-monitoring provides important contextualization cues and feedback on suitable behavior for reasonable time use and scheduling for individuals with high levels of time management disposition (Snyder 1974, 1979), which contributes to more effective time management behaviors and reduced procrastination. Individuals with high self-monitoring will pay more attention to environment cues, such as the importance and urgency of tasks or deadlines. Meanwhile, the external requirements of the task will be transformed into devoting more attention and allocating more time to ensure the completion of the task within the specified time through self-monitoring, which can enable the individual to effectively avoid the phenomenon of procrastination. On the other hand, for individuals with lower levels of

self-monitoring, the reduced or even inadequate reference and basis provided by contextualization cues could blunt the advantages of time management disposition and further prevent reasonable time planning and scheduling according to environmental requirements.

This study discusses the generation and impact mechanism of procrastination. As described in the results, self-control influences procrastination through time management disposition, and individuals with low self-control also have low time management disposition; therefore, they are more prone to procrastination. However, according to the theory of self-regulation, this finding provides empirical support that self-monitoring can strengthen or weaken the inhibition effect of self-control and time management disposition on procrastination; namely, self-monitoring in the process of task execution is manifested in individual's attention to internal state and external cues (such as the importance and urgency of the task). The present study has certain theoretical significance for understanding the generation of procrastination, especially the role of self-monitoring in it. On the one hand, even individuals with low time management disposition will mobilize more cognitive resources to complete the task as soon as possible if the importance and urgency of the task are recognized. On the other hand, even individuals with high time management disposition may procrastinate if they ignore the importance and urgency of tasks. Specifically, the present study has good practical significance for reducing procrastination, as a common phenomenon in current society, in individuals' work, study, and life. For one thing, the use of additional psychological resources should be reduced. For individuals with low self-control, activities unrelated to work should be reduced to improve their time management ability and reasonable allocation of working time, hence reducing contention for resources; for example, they should mute and put away their phone during work to minimize distractions. For another, they should participate in reasonable self-monitoring training, such as a self-learning class. It seems plausible that improving the attention to internal and external clues and planning and coping ability in relation to tasks to make up for the negative impact of insufficient time management is useful to avoid procrastination. For example, individuals with low time management disposition can minimize procrastination by emphasizing the importance and urgency of tasks.

Limitations and Future Directions

Despite these promising findings, our study has different limitations that future research should consider addressing. The first limitation is linked to the correlation research for analysis. The results are rely on self-report measures to obtain the scores for all variables, thus, no causal inference can be made between variables. In future studies, the reliance on multiple approaches might strengthen the validity of our results. As we can see from the research, self-monitoring could strengthen the negative effect of time management disposition on procrastination. Self-monitoring in the process of task execution is manifested in individual' s attention to internal and external cues. Therefore, we could manipulate the level of attention to task-related cues through experimental research to explore the effect of self-monitoring on procrastination. It also points out the direction of future research, For example, we can conduct self-monitoring training for individuals in the future to investigate the change of procrastination behavior after improving the self-monitoring level of individuals, and with the improvement of individual self-monitoring, the influence of self-control and time management disposition on procrastination changes.

In addition, given the cross-sectional data in the study, it is not possible to confirm the causal inference of the relations among these variables. In view of the limitations of our research design, we encourage future research to test the model with longitudinal. Attention should be paid to the addition of external observations in further research. Observing students for a longer period of time, for example students' performance for one semester, could reveal a distinct trajectory for the development of procrastination, which would provide a more convincing test of the mediating processes as well as greater insight into the underlying causal relations.

Finally, according to the self-regulation theory, what affects individuals' behavior includes motivation and willpower. Therefore, we still deem it an important endeavor in future research to design studies that explicitly investigate the self-monitoring skills (e.g., strategies, competencies) and the direction of self-regulation (e.g., will, goals, motives) in explaining phenomena such as procrastination. Observing the behavioral changes through experimental manipulation, we would have a detailed understanding of why people become procrastination and how can we avoid it, and customize interventions to the individual.

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Compliance with Ethical Standards

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of Interest On behalf of all authors, the corresponding author states that there is no conflict of interest, and manuscript is approved by all authors for submission and publication.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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