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Validating a measure of motivational regulation strategies and examining their relationship to English proficiency

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Abstract

Motivational regulation has been recognized as a crucial component of self-regulated learning. This paper presents the validation of a measure of motivational regulation strategies in an English as a foreign language context (MRS-EFL). A sample of 587 college freshmen attending an English enhancement course was recruited for data collection. Confirmatory factor analysis results supported the eight-factor structure of motivational regulation strategies, indicating a strong psychometric basis. The eight-factor 30-item scale showed good validity and reliability as well as invariance across gender. The results of multivariate analysis of variance (MANOVA) further revealed discrepancies in

motivational regulation strategies among students of various English proficiency levels. Our findings suggest that the MRS-EFL can serve a dual purpose, both as an evaluation instrument for educators to assess motivational regulation strategies among students and as a research tool for researchers to investigate the impact of motivational regulation strategies on English learning outcomes.

Keywords: scale validation; motivational regulation strategy; EFL; English proficiency

1. Introduction

There is a general consensus in the educational field that motivation is a key factor contributing to academic achievement and well-being (Kryshko et al., 2022; Schneider & Preckel, 2017). However, students are often challenged by motivational fluctuations in completing academic tasks when they perceive the tasks as difficult, irrelevant, or boring. Research in self-regulated learning (SRL), which stresses students' proactive engagement in the learning process (Zimmerman, 2013), has provided sufficient evidence that students' ability to respond effectively to motivational challenges and persist in their academic work has a significant impact on their learning outcomes (Boekaerts, 1996; Miele et al., 2020; Schunk & Zimmerman, 2008). An increasingly large body of studies has emphasized the importance of motivational regulation, which is usually defined as learners' autonomous control over their motivation to invest effort in accomplishing an academic activity (Wolters, 2011).

Prior studies in educational psychology have found that students at different age levels may use different types of strategies to regulate their learning motivation. For example, they may create a more playful learning situation or highlight the goal of their learning efforts to boost or maintain their motivation for a particular task (e.g., Schwinger et al., 2009; Wolters, 2003). There is also ample research suggesting that students who are capable of strategically self-regulating their motivation may, when faced with obstacles in learning, put in more effort (Miele & Scholer, 2018), persist longer (Smit et al., 2017), engage in less procrastination (Ljubin-Golub et al., 2019), or demonstrate better performance (Kryshko et al., 2020).

In the field of second language acquisition (SLA), motivation and self-regulatory strategies have long been accorded importance in understanding students' language learning behavior and achievement (Dörnyei, 2001; Kormos & Csizér, 2014). Motivation is widely recognized as a key factor influencing target language learning outcomes since being motivated or not makes all the difference as to how willingly learners persist in learning the target language (Ushioda, 2012). Clearly, motivational processes are critical to target language learning,

especially in an English as a foreign language (EFL) context, where traditional classroom-based language instruction may not provide sufficient support for learners (Csizér & Tankó, 2017). Consequently, learners' purposeful and goal-directed management of their efforts contributes essentially to their success in the target language (Oxford, 2011).

Motivational regulation, albeit a crucial aspect of self-regulated learning, has received relatively less attention in SLA. A number of empirical studies in SLA have examined students' strategic self-regulation in relation to L2 writing (Teng et al., 2020; Zhang & Dong, 2022). These studies, however, have built a solid basis for further empirical research into motivational regulation among second or foreign language learners. Given that the existing motivational regulation instruments were developed in general academic learning contexts (Schwinger et al., 2009; Wolters & Benzon, 2013), motivational regulation researchers in SLA have highlighted the necessity of adapting and validating these instruments across diverse language learning contexts, due to the subject-specific characteristics of second or foreign language learning (Bai & Guo, 2021; Gan et al., 2023; Luo & Gan, 2023). This study, therefore, aimed to validate a measure of motivational regulation strategies and investigate their relationship with English proficiency among Chinese college students. We believe that the study has the potential to contribute to the theoretical and pedagogical discussions on the regulation of motivation in an EFL learning context.

2. Literature review

2.1. Theorizing regulation of motivation

The proactive processes and self-beliefs that underlie self-regulated learning enable students to engage in academic learning and develop academic skills (Zimmerman, 2008). In earlier research, self-regulated learning was generally regarded as a volitional process that combines motivational variables (e.g., learning interest and self-efficacy) and other self-processes (e.g., information processing and integration, use of learning strategies, and metacognition; Boekaerts, 1996; Pintrich, 2004). In the last two decades, the strategic regulation of motivation has received increased attention in educational psychology, with empirical evidence supporting its role as an additional critical facet of self-regulated learning (Wolters & Benzon, 2013; Teng & Zhang, 2016a). Researchers generally view motivational regulation as activities in which students intentionally engage to initiate, sustain, or enhance their willingness to complete an academic task (Wolters, 2003). As a process that functions within the broader system of self-regulated learning, effective

motivational regulation encompasses three essential components: (1) *metamotivational knowledge*, that is, knowledge of motivation, which includes procedural, declarative, and conditional knowledge related to strategies; (2) *monitoring of motivation*, or metamotivational monitoring, which involves assessing one's current motivation levels, and (3) *control of motivation*, which entails the intentional implementation of motivational regulation strategies (Wolters, 2011).

Schwinger and Stiensmeier-Pelster (2012) developed the motivational regulation model based on Wolters' conceptualization of motivational regulation, illustrating the challenges students may experience in motivational regulation and how classroom-based intervention can be designed. According to Schwinger and Stiensmeier-Pelster (2012), one major challenge is that students are unaware of how to regulate their motivation due to a lack of metamotivational knowledge, which means that they do not possess accurate beliefs about how motivation functions. The process of motivational regulation usually begins with metamotivational monitoring, which occurs when a student uses metamotivational knowledge to determine the cause of the motivational deficiency and choose one or more relevant strategies to rectify it (Miele et al., 2020). Another typical challenge relates to strategic regulation, which requires students to be equipped with certain types of problem-solving skills to increase motivation and ensure task-related effort and persistence (Miele et al., 2020). For example, when students are faced with a dull or seemingly irrelevant task that may demotivate them, they can attempt to improve the situational interest of the learning activity by thinking of it as a game or relating it to their own interests and preferences, to increase the task's subjective value.

In SLA, as learning a second or foreign language requires a significant investment of time and effort on an ongoing basis, sustaining motivation and persistence is challenging for most learners (Alamer, 2022; Dörnyei, 2005; Noels et al., 2019; Seker, 2016). For example, foreign language learning most often occurs in classroom settings, where learner interest in the target language is typically low, and many students disengage as the objectives of mastering the target language appear too remote or personally unimportant (Ushioda, 2017). According to Dörnyei (2005), the use of motivational regulation strategies helps learners increase and bolster their learning motivation, sustain their ongoing motivated activity, and protect it from distractions. Consequently, it is important for second or foreign language learners to purposefully deploy strategies to maintain motivation when participating in both curricular and extracurricular activities in order to gain sufficient practice. These strategies, if employed regularly and effectively, may result in higher motivational levels (Teng, 2021), eventually leading to higher levels of proficiency in the target language. For example, Teng and Zhang (2016b) found that motivation-enhanced strategies positively predicted

EFL students' writing proficiency. Seker (2016) also reported the positive impact of Turkish students' different motivational regulation orientations on their success in foreign language learning.

In this study, we expand prior motivational research in SLA by employing Schwinger and Stiensmeier-Pelster's (2012) motivational regulation model as the theoretical framework. This model emphasizes the importance of both contextual factors, such as task characteristics, and individual factors, such as prior knowledge, on which the effective implementation of motivational regulation strategies may depend, while assuming learning achievement to be an outcome of effective motivational enhancement (Kryshko et al., 2020).

2.2. Existing instruments for assessing motivational regulation strategies

Since the aim of this study is to validate an instrument to assess motivational regulation strategies in an EFL context, it is necessary to offer a critical analysis of the instruments developed to evaluate learners' use of motivational regulation strategies. It should be noted that large-scale questionnaires facilitate the application of quantitative methods to construct a model for understanding the factorial structure of a particular social or psychological variable in a particular context (Teng & Zhang, 2016a).

To address the limitations of previous instruments (e.g., Wolters, 1998) which usually included a singular or limited range of strategies, Wolters and Benzon' (2013) developed the *Scale on Motivational Regulation Strategies* (SMRS) which consisted of 30 items. Exploratory factor analysis enabled them to identify a six-factor model that included *environmental structuring*, *regulation of performance goals*, *self-consequating*, *regulation of value*, *regulation of mastery goals*, and *regulation of situational interest*. The model explained about 69% of the variance, reflecting learners' adoption of a variety of motivational regulation strategies. The correlations between these strategies were positive and robust, with three strategies reflecting more intrinsic forms of motivation exhibiting notably stronger relationships (i.e., regulation of value/mastery goals/situational interest). However, some critical facets of students' motivation, including their sense of autonomy, goal setting, and attributions, are not represented well by the six strategies (Wolters, 2003). Additionally, the study was conducted with a sample of American college students, which may restrict the generalizability of its results to populations other than students with academic experience in the United States.

Schwinger et al. (2007, 2009) developed the *Motivational Regulation Questionnaire* (MRQ) based on Wolters' research (1998, 1999, 2003) to identify multiple strategies of motivational regulation in general educational settings.

This 30-item instrument included eight forms of motivational regulation strategies. For example, the MRQ includes two separate motivational regulation strategies relating to interest that target different levels of interest based on the development of interest theories (Hidi & Harackiewicz, 2001; Krapp, 2002). The *enhancement of personal significance* aims to establish a link between individual preferences and the task, while the *enhancement of situational interest* targets a temporary elevation in immediate enjoyment, which is caused primarily by external factors. The MRQ also includes three motivational strategies, each of which underscores an underlying goal of the learning process, that is, *performance-approach self-talk*, *mastery self-talk*, and *performance-avoidance self-talk*, which are differentiated according to achievement goal theory (Elliot et al., 2006). In each instance, students self-motivate by reflecting on the primary objective of their learning efforts, such as enhancing their competence and mastering challenging tasks (mastery goal), obtaining higher exam grades compared to their peers (performance-approach goal), or avoiding humiliation due to poor performance (performance-avoidance goal). In addition, the MRQ includes three strategies that represent more extrinsic types of motivation. The strategy of *self-consequating* refers to how a student may motivate themselves by self-reinforcement upon achieving a certain goal. *Proximal goal setting* is a strategy that involves dividing a long-term objective, such as completing a complex task, into easier-to-achieve subgoals since motivation tends to be greater for smaller and more attainable goals compared to more distant and complex goals (Bandura & Schunk, 1981). *Environmental control* refers to establishing a learning environment that facilitates productivity, such as working in a noise-free place like a library. The majority of these eight motivational regulation strategies had a modest positive correlation. However, no evidence was provided in Schwinger et al.'s (2007, 2009) studies or in their follow-up studies (e.g., Schwinger & Stiensmeier-Pelster, 2012) regarding whether the convergent and discriminant validity of the eight-factor model was empirically supported. In addition, as these studies focused on a particular group of students, that is, German 11th- and 12th-grade students, there has been limited evidence regarding the extent to which the MRQ can be applied to other student populations or other contexts, such as Asian EFL learning contexts.

Zhang and Liu's (2019) *Motivational Regulation Scale for Online Learning Community* (MRS-OLC), adapted from a study by Liou and Kuo (2014), was designed to assess motivational regulation in online professional learning communities. This study employed all 29 items in the original scale to represent the construct of motivational regulation in the context of an online learning community, which yielded good psychometric properties. The five subscales had good internal consistency, as indicated by the reliability coefficient, and confirmatory factor analysis results suggested satisfactory model fit. However, as the instrument

was only applied to teachers involved in an online training program, it may not be suitable for other learning communities or classroom contexts.

In SLA, Teng et al. (2020) created the *L2 Writing Strategies for Motivational Regulation Questionnaire* (L2WSMRQ) based on an earlier study (Teng & Zhang, 2016b) to investigate Chinese students' motivational regulation strategies in writing. Grounded in Dörnyei's (2001) self-regulated learning framework, this measurement tool comprised five subcategories with satisfactory psychometric properties reported in an L2 writing context. Good internal reliability for each factor was reported, and the five-factor model was also supported by exploratory and confirmatory factor analysis results. Although the L2WSMRQ focuses on college students' MRSs in L2 writing, it is one of the few motivational regulation strategy scales currently used in SLA, which inspired us to continue this line of research in SLA.

Clearly, despite the linkage between motivational regulation and adaptive functioning in academic learning, motivational regulation appears to be a construct that has not yet been widely incorporated into the second or foreign language curriculum (Cleary, 2006). Consequently, even though motivational regulation research may provide insights into the dynamics of the motivational regulation process (Miele & Scholer, 2018), the lack of an appropriate measure that comprehensively assesses learner usage of specific regulatory strategies in English learning may discourage classroom teachers from assessing students' task-specific motivational states and their capacity to overcome motivational obstacles in English learning.

3. This study

To address the above-mentioned research gap, the major objectives of the present study were to: (1) validate an adapted version of the *Motivational Regulation Questionnaire* (MRQ) (Schwinger et al., 2007, 2009) in the Chinese EFL context, that is, the *Motivational Regulation Strategies in EFL Learning Scale* (MRS-EFL); and (2) examine the potential differences in the use of motivational regulation strategies among students with various proficiency levels. The MRS-EFL includes eight subscales designed to assess a wide range of distinct strategies for regulating motivation. Although Schwinger et al.'s (2009) MRQ has been extensively used in European countries to explore the role of motivational regulation strategies in academic settings (Gehle et al., 2023; Ilishkina et al., 2022; Kryshko et al., 2020, 2022), it has not been empirically examined in an EFL context. Specifically, this study sought to address three research questions:

RQ1: What is the factor structure of the *Motivational Regulation Strategies in EFL Learning Scale* (MRS-EFL)?

RQ2: Is this factor structure invariant across gender?

RQ3: What are the relationships between EFL students' motivational regulation strategy use and their English proficiency level?

3.1. Method

3.1.2. Context and participants

This study was situated in a university English enhancement course that offered instruction in English reading, speaking, and writing. A total of 587 first-year students chose to participate in the study voluntarily. These students were native Chinese speakers from various disciplinary backgrounds (e.g., humanities, medicine, science, finance, engineering, and social sciences), having undergone formal English education for a minimum of nine years. They were between the ages of 17 and 21 ($M = 18.90$, $SD = 1.04$), and 45.3% of them ($N = 266$) were male students. The English instructors met with the participants for approximately three hours each week.

3.1.3. Instruments

The self-report survey in this study comprised two major sections. The first section requested participants to provide demographic information (i.e., age and gender), disciplinary backgrounds, and English proficiency level, while the remaining section assessed participants' use of motivational regulation strategies.

3.1.4. The Motivational Regulation Strategies in EFL Learning Scale (MRS-EFL)

The MRS-EFL used in this study drew on the *Motivational Regulation Questionnaire* (MRQ) developed by Schwinger et al. (2007, 2009), which is a 30-item, 5-point Likert scale questionnaire. The MRS-EFL comprised eight strategies (see Appendix A), including *mastery self-talk*, *enhancement of personal significance*, *performance-avoidance self-talk*, *performance-approach self-talk*, *environmental control*, *self-consequating*, *proximal goal-setting*, and *enhancement of situational interest*. Since the original MRQ was designed to evaluate learner use of motivational regulation strategies in general learning within a European context, we modified the language of the original items for use in Asian EFL environments. The MRS-EFL was rated using a 7-point Likert scale, with responses ranging from 1 ("Not at all true of me") to 7 ("Very true of me"). Participants were

asked to rate how much they believed the statement aligned with their learning behavior in English learning. This 7-point Likert scale has been frequently used in previous motivation regulation studies in SLA (e.g., Teng & Zhang, 2016b; Teng et al., 2020), and is considered more accurate than a 5-point Likert scale (Wang et al., 2023). Following Brislin's (1970) standard back-translation procedure, we initially developed the MRS-EFL in English before translating it into Chinese. Two experts in educational psychology were invited to assess the face and content validity of the MRS-EFL. Furthermore, ten students enrolled in a college English enhancement course were invited to provide feedback on the item wording of the MRS-EFL. Based on the comments from the experts and students, some slight changes were made to the wording of a couple of items in the MRS-EFL.

3.1.5. English placement test

Participants' English proficiency was assessed by using English placement test results. After entering the university, all freshmen were required to take an English placement test. This test was designed by experienced university English teachers and was similar in format and content to the College English Test-Band 4 (CET-4). In line with the CEFR B1 (*Common European Framework of Reference for Languages*; Council of Europe, 2001), the CET-4, as a nationwide EFL exam, is designed to objectively assess undergraduates' English proficiency and ensure that they meet the English proficiency standards set by the Ministry of Education. Following the CET-4, the English placement test in this study consisted of four components, namely reading comprehension (35%), listening comprehension (35%), translation (15%), and writing (15%), and underwent a stringent validation process to ensure its efficacy as an assessment instrument for freshmen before its administration. According to the overall test scores, the freshmen were classified into three English proficiency groups prior to the start of the English enhancement courses, with the first 15th percentile labeled as the high proficiency group, the bottom 15th percentile as the low proficiency group, and the remaining as the medium proficiency group. Among the 587 participants, 198 were high proficiency students (33.7%), 202 were medium proficiency students (34.4%), and 187 were low proficiency students (31.9%).

3.2. Data collection

This study was implemented in compliance with all pertinent ethical protocols. The English enhancement course instructors at the university were contacted to inquire about their willingness to have their students recruited for the questionnaire survey.

With the consent of the interested instructors, the researchers visited their classes to distribute the questionnaire via Wenjuanxing, an online survey application. All students participating in this study were notified that their involvement in the survey was voluntary and that they had the option to withdraw at any time. The survey took participants 5-10 minutes to complete a Chinese version of the MRS-EFL.

3.3. Data analysis

Preliminary analyses of the main variables revealed no missing data or outliers. Descriptive, correlation, and reliability analyses were conducted with IBM SPSS 26.0, and confirmatory factor analysis (CFA) via structural equation modeling (SEM) was conducted with AMOS 26.0 to evaluate the MRS-EFL's factor structure. Exploratory factor analysis (EFA) was not used in this study for two main reasons. First, as argued by Brown (2014), when the proposed instrument's factor structure is well-supported both in theory and by empirical evidence, conducting a CFA is more suitable than conducting an EFA. The MRS-EFL in this study was modified from the MRQ developed by Schwinger et al. (2009), which has a strong theoretical basis and had already been applied in prior empirical research (e.g., Schwinger et al., 2007, 2009). Therefore, CFA was appropriate for analyzing the dimensionality of the MRS-EFL. Second, researchers have found that in the examination of psychological constructs with highly intercorrelated subconstructs, EFA results can be misleading since EFA often calculates the highly correlated items as redundant (Fayers & Hand, 1997; Lam & Zhou, 2022). When implementing the MRS-EFL, we anticipated that the eight subscales would exhibit a correlation at a moderate ($0.30 \leq r < 0.50$) to high level ($0.50 \leq r$) (Cohen, 1988). For instance, students who regulated their motivation by *performance-approach self-talk* would tend to use *mastery self-talk* as well due to a similar goal-orientation, though these two self-talk strategies were theoretically and empirically distinct (Elliot & McGregor, 2001; Wolters & Benzon, 2013). Given the above reasons, CFA via SEM was conducted using the maximum likelihood estimation method as the factor analysis method in this investigation.

To validate the MRS-EFL, we proposed three structural models to evaluate its dimensionality (see Figure 1): (1) a first-order single-factor measurement model (Model 1), indicating that the conceptual construct of motivational regulation was unidimensional; (2) a first-order eight-factor measurement model (Model 2), specifying 30 items into eight distinct but interrelated strategies grounded in motivational regulation theory; and (3) a hierarchical model including eight factors that were subordinate to the higher-order factor (Model 3), suggesting that the construct of motivational regulation accounted for the correlations of the eight strategies.

We employed multiple fit indices for model fit examination (Hair et al., 2010; Hooper et al., 2008; Hu & Bentler, 1999), including the chi-square statistic (χ^2) with its degrees of freedom (df) together with the associated p value, the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean-square residual (SRMR). According to Hu and Bentler (1999), an acceptable model should have TLI and CFI values of no less than .90, and SRMR and RMSEA values of less than .08. We examined the convergent validity of the MRS-EFL with standard factor loading, composite reliability (CR), and average variance extracted (AVE) (Hair et al., 2010). We also evaluated the discriminant validity of the scale using heterotrait-monotrait (HTMT) ratio of correlations (Henseler et al., 2015).

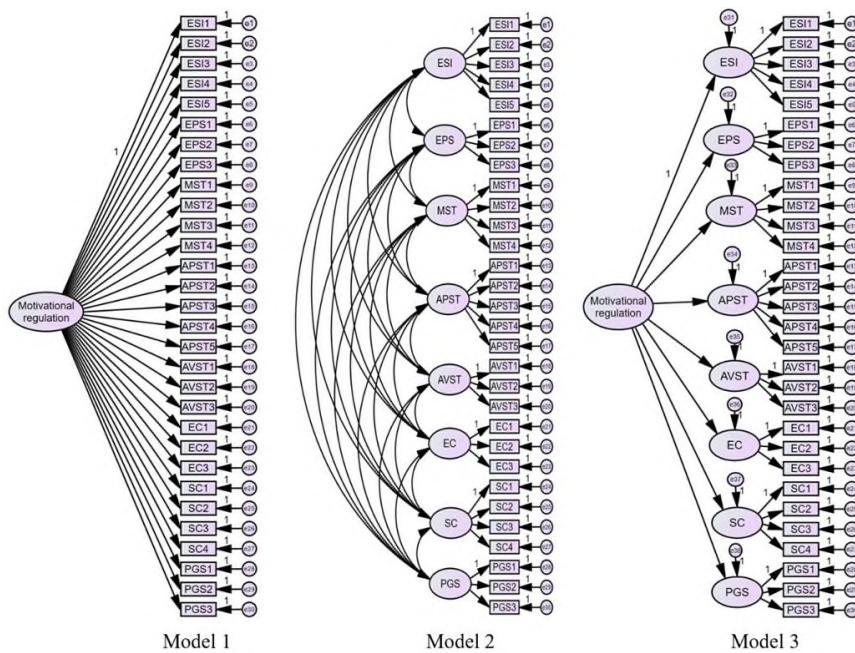


Figure 1 Graphical representation of models 1-3

Multigroup confirmatory factor analysis (MGCFA) was conducted to evaluate measurement invariance across gender, covering four levels: (1) configural invariance; (2) metric invariance; (3) scalar invariance; and (4) residual invariance. To support measurement invariance across gender, the threshold for the RMSEA and CFI change values (Δ RMSEA and Δ CFI) was set at no more than .01 (Cheung & Rensvold, 2002). Next, multivariate analyses of variance (MANOVAs) were conducted to evaluate significant differences in motivational regulation strategy use by English proficiency level among the three proficiency groups. After that, a series of post-hoc

analyses of variance (ANOVAs) were run to explore nuanced differences in the use of motivational regulation strategies across the English proficiency levels. In order to mitigate the overall Type I error rate, a Bonferroni correction was implemented to the α -levels of the ANOVAs (Tabachnick & Fidell, 2013).

4. Results

This section begins with a brief report of the preliminary findings. The major results of the data analysis are organized according to the research questions.

4.1. Preliminary findings

Descriptive statistics revealed that skewness (from -.65 to .06) and kurtosis (from -.52 to .18) were within the acceptable range from -2 to +2 (Kline, 2011). Table 1 presents the means, standard deviations, and correlations among all motivational regulation strategy variables. Correlation analyses showed that these variables had generally moderate to strong associations, and the correlation coefficients were all significant, primarily ranging from .42 to .84 (Cohen, 1988). The means and standard deviations of the 30 items in the scale are included in Appendix A, while their intercorrelation coefficients are presented in Appendix B.

Table 1 Descriptive statistics and correlations among the variables

Variables	M	SD	1	2	3	4	5	6	7	8
1. ESI	4.92	1.30	--							
2. EPS	5.01	1.39	.84	--						
3. MST	4.84	1.34	.69	.69	--					
4. APST	5.10	1.32	.57	.55	.78	--				
5. AVST	4.24	1.47	.32	.26	.45	.56	--			
6. EC	4.82	1.31	.59	.56	.66	.63	.44	--		
7. SC	4.65	1.44	.54	.51	.62	.61	.44	.70	--	
8. PGS	4.84	1.38	.65	.64	.71	.68	.42	.72	.75	--

Note. Correlations are significant at $p < .01$ level

4.2. Factor structure of the MRS-EFL

Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) test were conducted to assess whether this sample was suitable for factor analysis. Bartlett's test of sphericity showed a significant chi-square value of 3514.99 ($p < .001$), while the KMO value was .89, above the threshold value of .50 (George & Mallery, 2011).

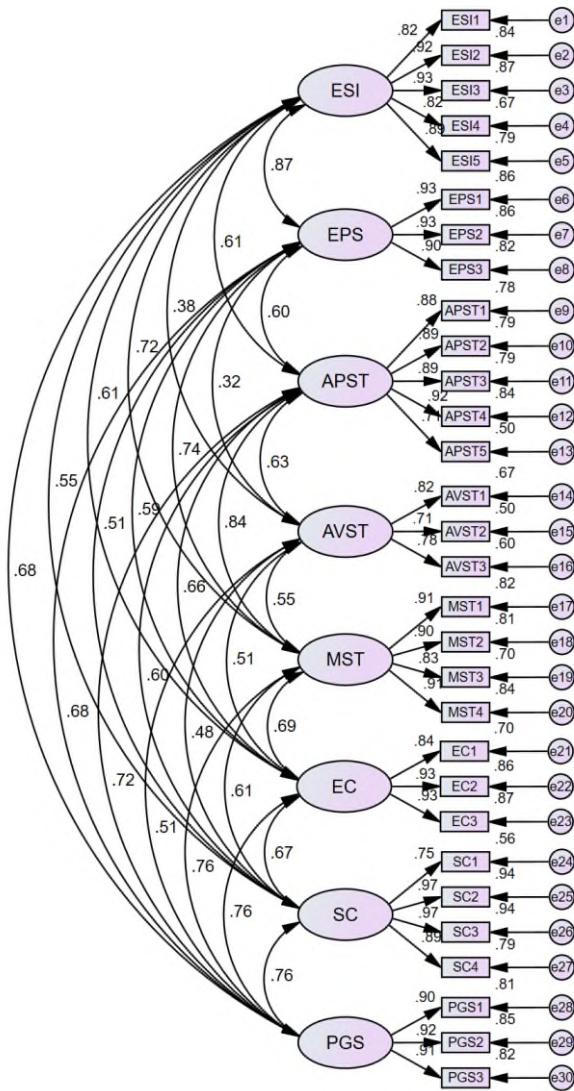


Figure 2 The eight-factor correlated model of MRS-EFL. All item parameter estimates and latent variables correlations were significant ($p < .001$)

CFA via SEM was performed to examine the MRS-EFL's factor structure as proposed in the three abovementioned models. Both Model 2 and Model 3 presented acceptable model fit indices, while Model 1 did not. After model comparisons, the first-order eight-factor model (Model 2) revealed the best model fit with the sample ($\chi^2 = 1753.94$, $df = 377$, $p < .001$; CFI = .93; TLI = .92; SRMR = .05; RMSEA = .07). Figure 2 shows that the 30 items loaded onto the eight correlated factors as designed, with standardized factor loadings ranging from .71 to .97 ($p < .01$),

higher than the benchmark value .50. Cronbach's alpha coefficients for the subscales varied from .83 to .95, indicating a satisfactory level of internal consistency among all items within each subscale (Brown, 2014). Moreover, the average variance extracted (AVE) values ranged from .59 to .84, while the composite reliability (CR) values varied from .81 to .94 (see Table 2). According to Hair et al. (2010), if the standard factor loadings and CR values are larger than .60, and AVE values are larger than .50, the convergent validity of the construct can be deemed adequate. Hence, our results indicate that the convergent validity of the MRS-EFL was established.

Table 2 Validity and reliability of the subconstructs in the MRS-EFL

Motivational regulation strategies	Items	Factor loadings	Average variance extracted	Composite reliability	Cronbach's alpha
Enhancement of situational interest	ESI1	.83	.77	.94	.94
	ESI2	.92			
	ESI3	.93			
	ESI4	.82			
	ESI5	.89			
Enhancement of personal significance	EPS1	.93	.85	.95	.94
	EPS2	.93			
	EPS3	.91			
Mastery self-talk	MST1	.91	.79	.94	.94
	MST2	.90			
	MST3	.83			
	MST4	.92			
Performance-approach self-talk	APST1	.88	.74	.93	.93
	APST2	.89			
	APST3	.89			
	APST4	.92			
	APST5	.71			
Performance-avoidance self-talk	AVST1	.82	.51	.75	.82
	AVST2	.71			
	AVST3	.78			
Environmental control	EC1	.84	.81	.93	.92
	EC2	.93			
	EC3	.93			
Self-consequating	SC1	.75	.81	.94	.94
	SC2	.97			
	SC3	.97			
	SC4	.89			
Proximal goal-setting	PGS1	.90	.83	.94	.94
	PGS2	.92			
	PGS3	.91			

We used the heterotrait-monotrait ratio of correlations (HTMT) in this study to examine discriminant validity, which can be assumed if the HTMT value between two factors does not exceed the threshold value of .90 (Henseler et al., 2015). Table 3 shows that all the constructs in the scale were less than .90, demonstrating acceptable discriminant validity of the MRS-EFL.

Table 3 HTMT ratio of correlations among the MRS-EFL factors

	1	2	3	4	5	6	7	8
1. ESI	--							
2. EPS	.88	--						
3. APST	.61	.59	--					
4. AVST	.35	.30	.65	--				
5. MST	.73	.73	.83	.52	--			
6. EC	.64	.61	.69	.51	.71	--		
7. SC	.59	.54	.66	.51	.67	.76	--	
8. PGS	.69	.69	.72	.47	.76	.77	.80	--

4.3. Measurement invariance

Measurement invariance was tested using MGCFAs, the configural, metric, scalar, and residual invariance. The baseline model was first analyzed, and the results showed an acceptable level of configural invariance with $\chi^2 = 2452.94$ ($df = 754$); TLI = .902; CFI = .915; SRMR = .065; RMSEA = .062, revealing that the latent structure model of the MRS-EFL was equivalent for the male and female samples. We further compared the metric, scalar, and residual models to the baseline model. As shown in Table 4, all ΔCFI and $\Delta RMSEA$ were less than .01, supporting measurement invariance of the eight-factor correlated model across gender.

Table 4 Measurement invariance analyses of gender ($N = 587$)

Model	Model fit					Model comparison		
	$\chi^2 (df)$	CFI	TLI	RMSEA	SRMR	Models	ΔCFI	$\Delta RMSEA$
M1	2452.94 (754)	.915	.902	.062	.065			
M2	2477.35 (776)	.915	.905	.061	.064	M2: M1	.000	.001
M3	2543.24 (812)	.914	.907	.060	.069	M3: M2	.001	.001
M4	2678.34 (842)	.908	.905	.061	.067	M4: M3	.006	-.001

Note. M1: Configural invariance, M2: Metric invariance, M3: Scalar invariance, M4: Residual invariance

4.4. Motivational regulation strategy use among students with different English proficiency levels

MANOVAs were performed to investigate the effect of proficiency level on motivational regulation strategy use. Figure 3 presents the mean differences in motivational regulation strategy variables among high, medium, and low English proficiency students. The MANOVAs results revealed an overall significant difference among the three proficiency groups on the combined dependent variables with a small effect size: Wilks' $\lambda = .93$, $F (16, 1256) = 3.04$, $p < .001$, partial $\eta^2 = .04$. According to the guidelines proposed by Cohen (1988), partial η^2 in the range of .01-.06 is regarded as

a small effect size, .06-.14 as moderate, and over .14 as large. When we examined the results for the dependent variables separately with a Bonferroni adjusted alpha level of .006, differences reaching statistical significance were found in enhancement of situational interest ($F = 14.75, p < .001$, partial $\eta^2 = .04$), enhancement of personal significance ($F = 16.14, p < .001$, partial $\eta^2 = .05$), mastery self-talk ($F = 5.94, p = .003$, partial $\eta^2 = .02$), and proximal goal setting ($F = 5.75, p = .003$, partial $\eta^2 = .02$).

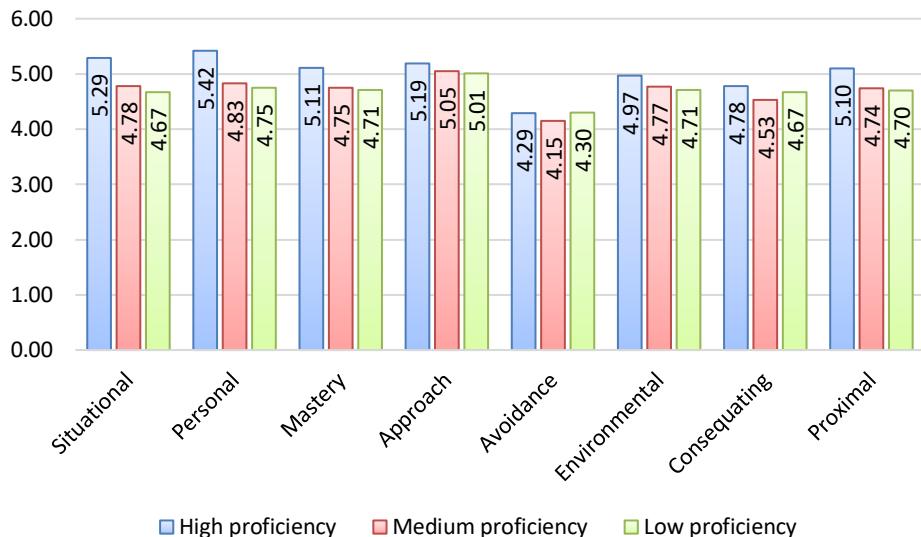


Figure 3 Mean differences in motivational regulation variables among high, medium, and low English proficiency students (Situational = enhancement of situational interest, Personal = enhancement of personal significance, Mastery = mastery self-talk, Approach = performance-approach self-talk, Avoidance = performance-avoidance self-talk, Environmental = environmental control, Consequating = self-consequating, Proximal = proximal goal setting)

The post-hoc ANOVAs using the Scheffe test were conducted to evaluate differences in the usage of motivational regulation strategies among the three English proficiency levels. The post-hoc test revealed a significant difference between high proficiency level and medium proficiency level in the usage of enhancement of situational interest (mean difference = .51, $p < .001$, partial $\eta^2 = .03$), enhancement of personal significance (mean difference = .59, $p < .001$, partial $\eta^2 = .03$), mastery self-talk (mean difference = .36, $p = .012$, partial $\eta^2 = .01$), and proximal goal-setting (mean difference = .36, $p = .014$, partial $\eta^2 = .01$). Significant differences were also found between high proficiency level and low proficiency level in all the above four MRSs (mean difference = .62/.68/.40/.40, $p < .001/.001/.006/.007$, partial $\eta^2 = .04/.04/.02/.01$).

5. Discussion

5.1. Factor structure of the MRS-EFL and measurement invariance across gender

Drawing on motivational regulation theories and existing instruments for evaluating motivational regulation, the study aimed to develop and validate a self-report measure, the MRS-EFL, to examine EFL students' reported motivational regulation strategy use in an EFL learning context. The results supported the application of the MRS-EFL as a measure of motivational regulation strategy use in an EFL context, with adequate psychometric properties.

The CFA results yielded substantial evidence for the eight-factor structure of the MRS-EFL, encompassing enhancement of personal significance, enhancement of situational interest, mastery self-talk, performance-avoidance self-talk, performance-approach self-talk, self-consequating, environmental control, and proximal goal setting, which corresponded generally well with the structure reported in Schwinger et al.'s (2007, 2009) MRQ. Model comparisons revealed that the MRS-EFL achieved the best fit in the eight-factor correlated model, which corroborated the original framework. In addition, this model fit equally well for both male and female students, as evidenced by measurement invariance test results. Furthermore, this study extended existing research by examining the convergent validity of the eight-factor structure with standard factor loadings, composite reliability (CR), and average variance extracted (AVE), and assessing discriminant validity using the heterotrait-monotrait (HTMT) ratio of correlations, thus providing further empirical evidence for the scale's validity (Henseler et al., 2015). Good reliability was also found for each subscale in the MRS-EFL, and this was consistent with prior research using the MRQ (Ilishkina et al., 2022; Schwinger et al., 2009), suggesting that the MRS-EFL has adequate internal consistency in EFL learning context. Our results therefore demonstrate that the MRS-EFL has good psychometric properties (i.e., structural validity and reliability), representing a valid and reliable instrument for examining Chinese EFL students' motivational regulation strategy use.

5.2. Motivational regulation strategy use among students with different levels of English proficiency

Our findings revealed discrepancies in the use of motivational regulation strategies among students of various English proficiency levels. High proficiency students had higher scores than medium and low proficiency students on almost all strategies

except performance avoidance self-talk. High proficiency students scored significantly higher on interest-related strategies, such as enhancement of personal significance and enhancement of situational interest, and on strategies that emphasize goals, such as mastery self-talk and proximal goal setting. These results suggest that high proficiency students may be more capable of deploying strategies of various types to manage their motivation in English learning, which is consistent with Teng et al.'s (2020) study exploring the relationship between writing motivation regulation strategies and L2 writing proficiency. One possible explanation for the high proficiency students' prominence in motivational regulation strategy use in the current study is that higher-achieving students may be more intrinsically motivated and hence more willing to persist longer in English learning (Bai & Guo, 2021; DiFrancesca et al., 2016), which might prompt them to implement motivational regulation strategies to overcome potential motivational difficulties in the English learning process (Schwinger & Stiensmeier-Pelster, 2012). Nevertheless, it should be acknowledged that the observed significant differences in the use of motivational regulation strategies between high proficiency students and medium/low proficiency students were for the most part rather small in effect size. This result is in line with Teng and Zhang's (2016b) research showing that EFL students' motivational regulation strategy use had a direct impact on their English writing scores, albeit with small effect sizes. Other studies have reported small effect sizes for similar constructs (Kryshko et al., 2020; Schneider & Preckel, 2017; Wolters, 1998, 1999). As Wolters (2003) argued, the immediate goal of motivational regulation strategy use is to sustain effort and overcome motivational problems, which in turn will eventually impact on learning outcomes. As such, significant direct effects of motivational strategies on language proficiency may not be anticipated. Interestingly, no significant differences were found between medium and low proficiency students' deployment of regulatory strategies, though medium-level learners generally reported higher levels of motivational regulation strategy use than low-level learners. An implication of this result is that future research should use qualitative data to better capture the nuanced differences in motivational regulation strategies between medium and low proficiency students.

Regarding EFL students' use of specific motivational regulatory strategies, the first two strategies, enhancement of personal significance and enhancement of situational interest, were found to be two distinct interest-related strategies in this study, which is consistent with Schwinger et al.'s (2007, 2009) research, though they are generally absent from or integrated into a single strategy (e.g., interest enhancement) in the existing motivational regulation instruments (Teng & Zhang, 2016b; Zhang & Liu, 2019). Our findings suggest that the EFL students in the current study were capable of distinguishing between these two strategies and applying them in different English learning activities. In line with Teng et al.'s

(2020) research, which discovered a substantive positive relation between EFL students' use of the interest enhancement strategy and writing proficiency, our study also found that high proficiency students reported greater application of the two motivational strategies related to interest than medium/low proficiency students, pointing to their potentially important role in the attainment of a higher level of language competence in the EFL learning context.

In keeping with Schwinger et al.'s (2007, 2009) study, we also identified three self-talk strategies related to goal orientation among EFL college students. This finding suggests that, regarding the strategic control of motivational states, college English learners appeared to be able to activate the objective of enhancing their knowledge and competence (mastery self-talk), which has been validated consistently across diverse academic learning settings (e.g., Teng & Zhang, 2016b; Wolters & Benzon, 2013). Our study also revealed that high proficiency students exhibited greater use of the mastery self-talk strategy when compared with their medium and low proficiency counterparts, suggesting that high proficiency students could be more intrinsically motivated to self-regulate their English learning motivation than low proficiency students. Furthermore, our study found that EFL learners could activate the goal of attaining high grades and surpassing their peers (i.e., performance-approach self-talk), and they were capable of activating the objective of avoiding embarrassment and poor performance (i.e., performance-avoidance self-talk). These two motivational strategies were most often integrated into one strategy (e.g., regulation of performance goals) in previous studies (Teng et al., 2020).

Proximal goal setting, which refers to students dividing a long-term objective into smaller, more attainable subgoals (Schwinger et al., 2009), has been inadequately studied as a motivational regulation strategy in prior research. Our study showed that this strategy was used significantly more frequently by high proficiency students, indicating that high-level EFL learners tended to motivate themselves more often than medium-/low-level learners.

In addition, this study revealed that EFL students might implement two other motivational regulation strategies, establishing a learning-conducive working environment (i.e., environmental control) and rewarding themselves for successfully completing study tasks (i.e., self-consequating), though there was no statistical difference in the reported application of these two strategies among students of various proficiency levels. According to motivational regulatory theory, self-consequating is based on the principles of behavioral reinforcement (Schwinger et al., 2009), although it has rarely been reported in previous EFL research. Our findings suggest that the college EFL learners in the current study might motivate themselves via self-reinforcement upon attaining specific objectives, such as completion of their daily English assignments.

6. Conclusion

A valid and reliable instrument is crucial for effective measurement, intervention, and improvement in teaching and learning (Wang et al., 2023). This study adapted Schwinger et al.'s (2007, 2009) MRQ and extended its application to measure Chinese college students' motivational regulation strategy use in EFL learning by validating the MRS-EFL, which demonstrated good reliability, construct validity, and concurrent and discriminant validity. The study has an important pedagogical implication: Given its good psychometric properties, the MRS-EFL can provide a practical tool for EFL teachers to diagnose students' strategic control of English learning motivational states. The scale can also serve as a useful tool for examining how the process of motivation regulation unfolds in the EFL learning context.

The results of the study also revealed positive relations between EFL students' motivational regulation strategy use and their proficiency level as high proficiency students showed greater use of motivational regulation strategies, especially interest-related strategies, compared to their medium/low proficiency counterparts. This finding supports the significance of offering tailored motivational support for students of varying proficiency levels in their self-regulated learning (Gan, 2020; Gan et al., 2023), especially in EFL learning contexts where stratified teaching has been gaining popularity in recent years (Huang & Wu, 2020).

Despite the contributions of the study, it is important to recognize certain potential limitations. First, we validated the MRS-EFL using only one Asian EFL population, Chinese EFL students enrolled in a university English enhancement course. Our findings may not necessarily be generalized to English learners in other cultural and social contexts. More empirical studies examining diverse EFL populations are needed to provide robust support for this measure of motivational regulation strategies. Second, our data were mainly collected via a self-report survey, which could potentially cause social desirability bias, thereby limiting our understanding of the participants' motivational regulation in EFL learning. Additional research should incorporate multiple data sources, including individual interviews and personal logs or diaries, to investigate motivational regulation more deeply. Third, this study reported participants' proficiency levels according to existing placement test results, and therefore the causality between EFL students' motivational regulation strategy use and English proficiency cannot be claimed. Future research could capture students' English language learning proficiency by means of specifically administered tests. Fourth, this study was cross-sectional in nature, which cannot ensure causality between EFL students' motivational regulation strategy use and English proficiency. We that suggest that future research should employ a longitudinal approach to establish causal links between the examined variables and students' learning achievement, which will enable us to better determine the predictive effects of MRS-EFL dimensions on students' success in learning a second or foreign language.

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APPENDIX A

Motivational Regulation Strategies in English as a Foreign Language Learning Scale (MRS-EFL) and descriptive analysis of items

Motivational regulation strategies	M	SD
Enhancement of situational interest (ES)		
ES1 I make my English learning more pleasant for me by trying to arrange it playfully.	4.85	1.39
ES2 I try to invent a corresponding game if I have to learn or do certain tasks in English.	4.84	1.45
ES3 I make myself look for ways to bring more fun to the tasks in English learning.	4.93	1.45
ES4 I carry out the tasks in English learning by highlighting the features that are fun.	5.09	1.43
ES5 I consider a way to make English learning more entertaining.	4.87	1.49
Enhancement of personal significance (EP)		
EP1 I look for connections between the tasks in English learning and my life as such.	4.91	1.50
EP2 I strive to relate the English learning material to my own experiences.	5.05	1.43
EP3 I try to establish relations between English learning tasks and my personal interests.	5.06	1.48
Mastery self-talk (MS)		
MS1 I persuade myself to work intensely in the course to improve my English proficiency.	5.03	1.45
MS2 I persuade myself to keep on English learning in order to find out how much I can possibly learn.	4.90	1.44
MS3 I challenge myself to finish the task in the English course and thus learn a lot for me personally.	4.58	1.49
MS4 I tell myself that I should keep on learning in the English course in order to learn as much as possible.	4.87	1.48
Performance-approach self-talk (AP)		
AP1 I call my attention to the fact of how important it is to obtain good grades in the English course.	5.11	1.48
AP2 I attempt to call myself to intense work by focusing on obtaining good grades in the English course.	4.92	1.55
AP3 I call my attention to the fact of how important it is to do well in English tests and exams.	5.22	1.43
AP4 I tell myself that I should keep on learning if I wish to reach a good exam in the English course.	5.20	1.46
AP5 I think about how my grades will worsen if I refrain from learning in this English course.	5.04	1.52
Performance-avoidance self-talk (AV)		
AV1 I tell myself that I have to push me more if I do not want to make a fool of myself in English classes.	4.66	1.61
AV2 I imagine that my classmates make fun of my poor performance in English classes.	3.81	1.85
AV3 I think that it would be very unpleasant to perform worse than the others in the English course.	4.24	1.70
Environmental control (EC)		
EC1 I consciously choose such English learning times when I can concentrate especially well.	4.83	1.42
EC2 Prior to beginning with English learning, I strive to eliminate all possible distractions.	4.80	1.42
EC3 I make sure that distractions occur as seldom as possible in my English learning.	4.84	1.37
Self-consequating (SC)		
SC1 I tell myself that after work I can do something nice, if I first keep on English learning now.	4.75	1.48
SC2 I make a deal with myself saying that I will do something pleasant after I finish the English task.	4.67	1.58
SC3 I promise myself that, after English work is done, I will do something that I like.	4.71	1.57
SC4 I put the prospect of any reward to myself in case I finish English work.	4.49	1.63
Proximal goal setting (PG)		
PG1 I break down the English learning workload in small segments so I get the feeling that I can handle it more easily.	4.76	1.48
PG2 I approach English work step-by-step in order to get the feeling that I proceed well.	4.96	1.44
PG3 I tell myself that I can master the English learning tasks if I set myself sub goals.	4.80	1.47

Appendix B Intercorrelation coefficients of MRS-EFL items

Items	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1. ES1	—																													
2. ES2	.75	—																												
3. ES3	.75	.89	—																											
4. ES4	.64	.74	.79	—																										
5. ES5	.75	.80	.80	.71	—																									
6. EP1	.70	.70	.71	.63	.80	—																								
7. EP2	.70	.70	.70	.61	.80	.87	—																							
8. EP3	.72	.72	.75	.67	.81	.83	.83	—																						
9. MS1	.63	.60	.61	.57	.65	.63	.64	.65	—																					
10. MS2	.60	.58	.57	.52	.63	.64	.66	.63	.83	—																				
11. MS3	.52	.50	.50	.48	.52	.49	.49	.51	.74	.74	—																			
12. MS4	.60	.54	.59	.54	.63	.61	.62	.61	.82	.81	.80	—																		
13. AP1	.47	.47	.47	.45	.46	.46	.47	.49	.65	.62	.58	.67	—																	
14. AP2	.55	.51	.51	.48	.53	.53	.54	.54	.71	.70	.67	.74	.81	—																
15. AP3	.42	.46	.48	.47	.45	.45	.46	.47	.63	.61	.53	.64	.83	.77	—															
16. AP4	.50	.50	.53	.50	.51	.52	.52	.54	.71	.72	.68	.74	.78	.81	.82	—														
17. AP5	.29	.32	.35	.39	.30	.25	.31	.33	.53	.46	.52	.56	.60	.57	.65	.67	—													
18. AV1	.30	.33	.36	.35	.31	.24	.29	.31	.45	.44	.54	.52	.47	.46	.50	.57	.72	—												
19. AV2	.15	.14	.16	.18	.15	.12	.11	.11	.20	.16	.29	.24	.24	.24	.29	.26	.44	.58	—											
20. AV3	.24	.25	.26	.24	.29	.24	.28	.26	.37	.35	.38	.39	.41	.44	.44	.45	.53	.60	.62	—										
21. EC1	.51	.52	.51	.48	.50	.47	.49	.52	.60	.59	.58	.61	.52	.61	.53	.57	.46	.42	.27	.39	—									
22. EC2	.47	.49	.48	.45	.48	.45	.49	.50	.57	.56	.48	.57	.51	.56	.52	.55	.44	.38	.29	.41	.77	—								
23. EC3	.50	.52	.51	.49	.52	.49	.53	.53	.58	.57	.51	.59	.51	.56	.49	.54	.44	.38	.28	.40	.77	.87	—							
24. SC1	.44	.46	.43	.41	.44	.44	.45	.45	.57	.58	.58	.62	.51	.60	.50	.59	.49	.45	.29	.41	.69	.67	.69	—						
25. SC2	.46	.49	.48	.47	.46	.45	.46	.47	.50	.51	.52	.56	.47	.55	.45	.53	.44	.42	.26	.35	.59	.58	.57	.72	—					
26. SC3	.45	.48	.47	.45	.45	.44	.44	.46	.50	.50	.49	.54	.47	.57	.45	.52	.44	.41	.25	.34	.59	.59	.57	.71	.94	—				
27. SC4	.43	.46	.44	.41	.43	.41	.41	.42	.46	.47	.50	.52	.45	.56	.40	.48	.39	.39	.27	.37	.57	.56	.54	.66	.86	.86	—			
28. PG1	.54	.50	.52	.47	.53	.55	.55	.54	.58	.63	.56	.63	.53	.62	.51	.59	.46	.42	.26	.38	.61	.60	.61	.63	.63	.65	.65	—		
29. PG2	.59	.57	.58	.55	.58	.58	.59	.61	.63	.57	.55	.63	.57	.63	.54	.63	.50	.45	.22	.38	.61	.61	.65	.64	.65	.67	.67	.84	—	
30. PG3	.58	.55	.54	.53	.60	.57	.57	.58	.63	.64	.56	.66	.58	.68	.54	.61	.47	.40	.22	.39	.64	.65	.67	.67	.67	.67	.81	.83	—	

Note. Correlations are significant at $p < .01$