

Validating a self-control measurement for L2 learning: A factor analysis study¹

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Introduction

Self-control is a key capacity for successful second/foreign language (L2) acquisition. L2 learning is a rewarding but long-term process, requiring months or even years for substantial development. Because our everyday lives are filled with temptations that distract from L2 learning (e.g., smartphones and video games), we easily succumb to them during the learning process. Taguchi (2020), for example, revealed that for university students, smartphones were the most common temptation disturbing their L2 learning, followed by TV, physiological conditions (e.g., drowsiness and fatigue), and friends/family.

L2 researchers and practitioners may conclude from this that students are not motivated enough to concentrate on their studies. In one sense, this is true. Even highly motivated learners, however, cannot always resist temptations that distract them from learning. In these cases, self-control (SC) is needed to achieve their goals. Indeed, Mercer and Dörnyei (2020) argue that SC is crucial for the successful pursuit of long-term goals, but this line of research has been neglected in L2 fields. On the other hand, there are cumulative research histories in psychology. This paper aims to apply a promising SC study to the L2 learning domain.

Self-control research

What is self-control? The term is often used interchangeably with “self-regulation,” and is the less often used of the pair. Schmeichel and

Baumeister (2004, p. 86) distinguish the two terms as follows:

- Self-regulation—both conscious and unconscious alteration of responses by the self.
- Self-control—a more deliberate and conscious process of altering the self’s responses . . . inhibition of unwanted impulses.

Focusing on self-control in particular, Maranges and Baumeister (2016) offer a fairly typical definition reflecting the nature of the concept: “the ability to alter one’s thoughts, emotions, and behaviours or to override impulses and habits” (p. 42).

Ideas concerning self-control have a long history. The origin of recent scientific research trends dates back to a series of studies called “marshmallow tests” conducted between the late 1960s and early 1970s by Walter Mischel and his associates (see, e.g., Mischel, 2014, Mischel & Ebbesen, 1970). Their research was conducted on children aged 4 and 5 who attended Stanford University’s nursery school. In the experiment, children faced a tough dilemma: immediately receiving a small reward, such as one marshmallow, or resisting the temptation of the immediate reward in exchange for a larger reward later, such as two marshmallows. The results showed large individual differences in the preschoolers’ reaction. Those who managed to delay gratification (i.e., resist temptation) used various tactics, such as covering their eyes with their hands, talking to themselves, and singing. The research also found that children waited much longer for rewards when the rewards were absent than when any rewards were available for attention. While the self-control strategies these children exerted are intriguing, the further importance of these studies needs to be highlighted. Mischel, Shoda, and Peake (1988), for example, revealed that children who waited longer in the experiment mentioned above became adolescents who were more

academically and socially competent and more able to cope with frustration and resist temptation than their peers.

The advantages of self-control have also been reported in many other studies. Tangney, Baumeister, and Boone (2004) found that university students with high self-control had better academic grades, less binge-eating and alcohol abuse, and better relationships and interpersonal skills than students with low self-control. Duckworth and Seligman (2006) revealed that adolescent girls were more self-disciplined (i.e., self-controlled) than their male classmates, and that this advantage was more closely linked to final course grades than to achievement or aptitude tests. Their investigation suggests that girls' higher GPAs may result from the assumption that they are more self-disciplined. Duckworth, Tsukayama, and May (2010) provided evidence that self-control causally influenced the academic achievements of fifth to eighth graders in America. Moffitt et al. (2011), following a group of 1,000 children over 30 years, demonstrated that children with poor self-control grew up to have more financial difficulties, be more likely to be convicted of a criminal offense, and have more alcohol and drug problems at the age of 32. De Ridder, Lensvelt-Mulders, Finkenauer, Stok, and Baumeister (2012) investigated the behavioural effect of self-control through a meta-analysis of 102 studies (total $N = 32,648$) and confirmed the benefits of high self-control in school, work, interpersonal relationships, well-being, and well-adjustedness. Finally, a survey of approximately 17,000 British people conducted by Daly, Delaney, Egan, and Baumeister (2015) revealed that low self-control in childhood was linked with the emergence and persistence of unemployment in adulthood, suggesting that self-control could shape trajectories of occupational success and unemployment rates spanning lifetimes or even generations.

The results reviewed above suggest that capacity for self-control plays a decisive role in not only academic achievement but also

happiness—indeed, that it is one key to distinguishing successful people from unsuccessful ones.

The process model of self-control

There are several theories of self-control in this research domain. One is the “process model of self-control” proposed by Duckworth and her associates (e.g., Duckworth, Gendler, & Gross, 2014, Duckworth, White, Matteucci, Shearer, & Gross, 2016). Because our everyday lives are filled with temptation, strategic techniques to resist temptation are necessary for achieving goals. Strategies of this kind do not always work in the same way. Some apply earlier in the stage of impulse generation than others. Duckworth and her associates proposed a division of the diverse range of strategies into five families corresponding to distinct stages of impulse generation.

The process model posits two macro-strategy types, situational and cognitive. Under each of these are multiple micro-strategies (see also Figure 1):

✧ Situational strategies:

- *Situation selection* (SS)—Intentionally choosing to be in places or with people to strengthen desired impulses and attenuate undesired ones.
- *Situation modification* (SM)—Purposefully changing physical or social circumstances to either strengthen desired impulses or attenuate undesirable ones.

✧ Cognitive strategies:

- *Attentional deployment* (AD)—Selectively attending to certain features of the situation that either heighten the salience of long-term goals or minimize the salience of temptation.
- *Cognitive change* (CC)—Deliberately appraising situations in

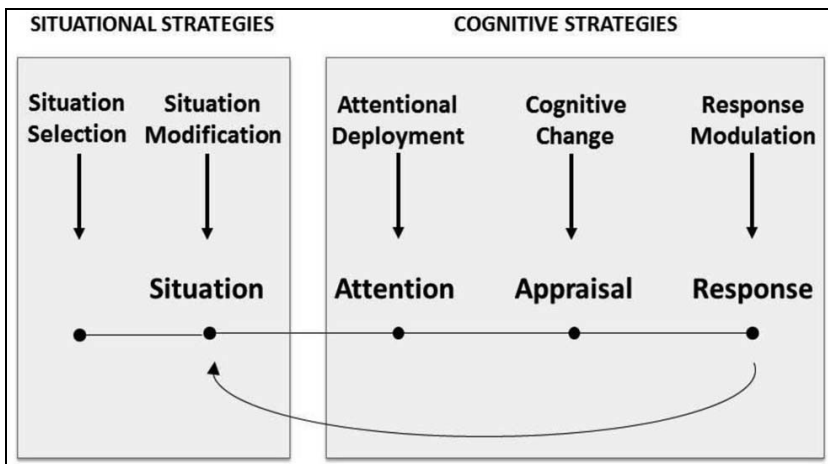


Figure 1. The process model of self-control (Duckworth et al., 2016, p. 330)

ways that make temptation less attractive, valued long-term goals more attractive, or both.

- *Response modulation* (RM)—Voluntarily suppressing an undesirable impulse or enacting a desirable one.

Duckworth et al. (2016) then conducted a survey to test this hypothesis. The results revealed that the majority of strategies nominated by high school students could indeed be classified under this framework. The students rated SS and SM strategies as more effective than other strategies, and students instructed to use SM strategies were more likely to achieve their academic goals than students instructed to use RM or no strategy at all.

The process model framework offered by Duckworth et al. (2016) functions as a guide to assess SC strategy use. However, to my knowledge, there is no research using this framework in L2 learning fields except for Taguchi (2020). He asked 123 students with English-related majors to list

one temptation disturbing their English learning, along with a coping strategy, and to rate the effectiveness of strategies in hypothetical dilemmas. Applying Duckworth's framework, his study found that students used SM strategies most frequently but the other four strategy types relatively equally, and that, in the hypothetical L2 dilemmas, students rated SM strategies as most effective, followed by CC and SS strategies, in that order.

The study

There are no standardized measures based on the process model classification and no research using this model in L2 learning fields to quantitatively assess how L2 learners use SC strategies in relation to L2 learning. Thus, the current study aims to apply Duckworth and her associates' (Duckworth et al., 2014, Duckworth et al., 2016) process model of self-control to L2 learning. In this study, the following research questions are addressed:

RQ1: *How valid and reliable is the L2 SC scale?*

RQ2: *Which SC strategies do Japanese university students use most often?*

RQ3: *Are there any differences between male and female students in the use of SC strategies?*

RQ4: *Are there any differences between high-proficiency and low-proficiency L2 learners in the use of SC strategies?*

Participants

Participants were students from a national university in central Japan. In total, 810 students (335 male; 468 female; 7 no answer) completed a questionnaire. All of them were first-year students in a compulsory English course, and most were 18 or 19 years old. Their majors ranged

from human sciences to creative sciences to natural sciences. Their self-assessed English proficiency levels were divided between “beginner” (190 students, 23.5% of total), “post-beginner” (340 students, 42.0% of total), “lower-intermediate” (224 students, 27.7% of total), and “intermediate” (49 students, 6.0% of total).

Instrument

This study adopted a questionnaire with two parts. The first part consisted of items measuring L2 learners’ attitudes, motivation, and behaviours concerning English learning, and the second part consisted of items about the students’ background, including their gender, year at university, age, and perceived English proficiency levels. Items in the first part were measured by six-point Likert scales (1: *Strongly disagree* to 6: *Strongly agree*). The total number of questionnaire items was 72. Because the current study aimed to develop a scale for L2 SC strategy use and reveal its characteristics in relation to L2 learning, from among the many items on the questionnaire, items focused on self-control in learning English were chosen for the study. With regard to the self-assessed English proficiency levels, this study adopted the scale from Dörnyei with Taguchi (2010). The questionnaire was in Japanese.

The items on L2 self-control were developed based on Duckworth et al. (2014) and Duckworth et al. (2016) with respect to the definition of each strategy and Taguchi (2020) with respect to English learning situations. SC components used in this study were as follows (see Appendix for the full items of the English version):

- *Situation Selection* (SS) (6 items). Sample items: “Because there are lots of distractions from studying at home, when I study English, I go to libraries or cafes” and “When I study English, I go to places with no distractions from studying.”

- *Situation Modification* (SM) (8 items). Sample items: “When I study English, if invited out by my friends, I tell them that I will join them when I’ve finished studying” and “When TV programs I want to watch are on during my English study, I record them to watch later.”
- *Attentional Deployment* (AD) (7 items). Sample items: “When I study English, I imagine my future situation” and “When I study English, I imagine myself using English by looking at photos of and TV programs about foreign countries.”
- *Cognitive Change* (CC) (8 items). Sample items: “I try to think that, even if the task is large, I will be able to complete it by breaking it into smaller, more feasible chunks” and “I try to think that I can study English during travel time.”
- *Response Modulation* (AM) (6 items). Sample items: “I try to direct my will to studying English by, for example, turning down invitations from friends” and “However attractive other activities are, once I have decided to complete an English assignment, all I need to do is just do it.”

Data collection procedure

Data were collected in April and May 2017. First, teachers in charge of the English class at the university were approached by the author. Those who agreed to participate in the study distributed the questionnaire during regular English class time. They allowed 10 to 15 minutes for the students to complete it.

Data analysis procedure

The collected questionnaire data were processed using IBM SPSS Statistics version 26. For RQ1, exploratory factor analyses with principal factors extraction and promax rotation were conducted. For RQ2, a repeated-measures analysis of variances (ANOVA) was conducted to

compare types of SC strategies used by L2 students. For RQ3 and RQ4, independent-sample *t*-tests were conducted to compare strategy use between males and females and between low-proficiency learners (at “beginner” and “post-beginner” levels) and high-proficiency learners (at “lower-intermediate” and “intermediate” levels).

Results and discussion

Validity and reliability of the L2 SC strategy scale (RQ1)

In order to determine the best items for each of the SC subscales, factor analyses were conducted. Because of the large number of variables, separate analyses were conducted for the factors of situational and cognitive strategies. The analysis strategy involved the following procedures. First, the number of factors for each strategy was set (two factors for situational strategies and three factors for cognitive strategies). Next, any items that did not contribute appreciably to the solution (i.e., those with loadings $< |.40|$ or that cross-loaded on other factors) were eliminated. This process was repeated until a simple structure and sufficient Cronbach alpha indexes of internal consistency were obtained for most of the factors.

Table 1 presents a summary of the factor pattern matrix of each macro-strategy. An examination of the factor structure revealed that the factor analytical results made good theoretical sense and did not contradict the initial conceptual framework that guided the development of the scale. Although the Cronbach alpha coefficients of a few specific SC strategies are not very high (.62 for SS and .66 for SM) and need to be treated with some caution, they are still acceptable for such short scales.

L2 SC strategy use (RQ2)

In order to ascertain which SC strategies Japanese university students used more often, a repeated-measures ANOVA was conducted. The means

Table 1

Rotated Pattern Matrix of Situational and Cognitive Strategies

Situational strategies					Cognitive strategies					
	SS ($\alpha=.62$)	SM ($\alpha=.66$)	<i>M</i>	<i>SD</i>		AD ($\alpha=.72$)	CC ($\alpha=.80$)	RM ($\alpha=.76$)	<i>M</i>	<i>SD</i>
<u>SS</u>			<u>3.11</u>	<u>1.16</u>	<u>AD</u>				<u>2.92</u>	<u>1.06</u>
SS3	.62	-.12	2.75	1.40	AD4	.86	-.01	.05	3.06	1.20
SS5	.78	.09	3.47	1.33	AD5	.63	.07	-.07	2.78	1.20
<u>SM</u>			<u>3.31</u>	<u>0.83</u>	<u>CC</u>				<u>4.19</u>	<u>0.81</u>
SM1	-.16	.67	2.94	1.06	CC2	.04	.58	.12	4.39	1.00
SM3	.10	.48	3.59	1.25	CC4	.08	.46	.11	3.78	1.25
SM6	.11	.55	3.01	1.27	CC5	.04	.74	.04	4.43	1.04
SM7	-.02	.58	3.70	1.12	CC7	-.09	.80	-.12	4.34	0.98
					CC8	.10	.66	-.04	3.99	1.13
					<u>RM</u>				<u>3.38</u>	<u>0.83</u>
					RM1	.11	-.11	.68	3.11	1.00
					RM3	-.01	-.05	.76	3.33	1.12
					RM5	-.12	.21	.64	3.61	1.03
					RM6	-.03	.01	.64	3.50	1.13
Correlation coefficients					Correlation coefficients					
SS	1.00				AD	1.00				
SM	.57	1.00			CC	.59	1.00			
					RM	.55	.38	1.00		

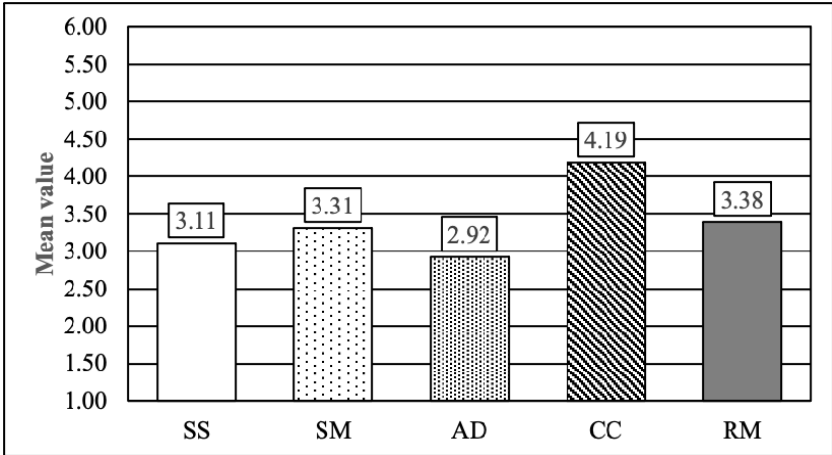


Figure 2. Mean values of SC micro-strategy use by Japanese university students.

and standard deviations are presented in Table 1 (see also Figure 2). There were significant differences in strategy use, $F(3.07, 2479.53) = 341.79$, $p < .001$, $\eta_p^2 = .30$, medium effect size. Post hoc pairwise comparisons using a Bonferroni adjustment showed that Japanese university students were more likely to use the strategies of CC than RM, $p < .001$, $d = 0.99^2$. The adjacent pairs of the others in declining order of means (i.e., RM, SM, SS, and AD) were also significant, $ps = .003$ to $< .001$ and ds from 0.08 to 0.20. The ANOVA result indicates that these university students learning English in Japan used CC strategies most frequently and the others, though some differently, roughly equally.

The results were somewhat different from those of Taguchi (2020), in which students with English-related majors used SM strategies most frequently in learning English and others almost equally. Since the sample of the current study consisted mainly of students with non-English-related majors, they may have reported using CC strategies most due to less motivated to learn English. A comparison of both results

suggests that academic major or learning motivation in particular might affect action-taking in the earlier stages of impulse generation toward goals.

Difference in SC strategy use by gender (RQ3)

In order to determine whether reported SC strategy use differed between male and female students, independent-sample *t*-tests were conducted across the five sub-strategies. Table 2 displays the results of *t*-tests in the SC use between them. *T*-tests revealed that female students' reported SC use was significantly higher than male students' reported SC use in SM, AD, CC, and RM, with the effect size of Cohen's *d* being small or small-to-medium. These results indicate that female students were more likely to use SC strategies and SM strategies in particular than their male counterparts.

Compared with the results of Duckworth and Seligman (2006), in which female junior high school students were found to be more self-disciplined (i.e., self-controlled) than male counterparts, the current results go one step further to reveal gender differences in the types of SC strategy use. Specifically, female students were more likely to modify their English learning situations.

Difference in SC strategy use by perceived English proficiency level (RQ4)

In order to determine whether reported SC strategy use differed between low- and high-proficiency learners, independent-sample *t*-tests were conducted across the five sub-strategies. As seen in Table 3, there were significant differences between the two groups in scores of SM, AD, CC, and RM strategy use; these represent small or small-to-medium effects. These results indicate that high-proficiency learners reported relatively greater propensity to control themselves by deploying their attention (AD) and changing their cognition (CC) in L2 learning.

Table 2

Results of T-Tests about the SC Use between Male and Female Students

	Male (n = 335)		Female (n = 468)		<i>t</i> (801)	<i>p</i>	Cohen's <i>d</i>
	<i>m</i>	<i>sd</i>	<i>m</i>	<i>sd</i>			
SS	3.04	1.22	3.14	1.12	-1.23	.221	.09
SM	3.16	0.86	3.41	0.80	-4.24	<.001 ***	.30
AD	2.82	1.03	2.98	1.06	-2.10	.036 *	.15
CC	4.10	0.82	4.24	0.80	-2.43	.015 *	.17
RM	3.30	0.87	3.44	0.79	-2.24	.025 *	.17

* $p < .05$. *** $p < .001$.

This result, showing that the use of macro-situational strategies (SS and SM) did not distinguish high-proficient learners from low-proficient counterparts, is worth discussing. Previous studies (e.g., Duckworth et al., 2016) indicated that situational strategies were effective. While exact comparisons are implausible, the results of the current study can be ascribed to the intentions of L2 learners. It is true that avoiding distractions or modifying learning situations to include fewer distractions gives learners more opportunities to study. However, such strategies do not automatically lead to intensive concentration on study. Because the students in this study took a compulsory English course and many of them were not highly motivated to control their learning situations, they had to study in well-ordered learning situations. Under these circumstances, however, even highly English proficient students arguably developed their L2 abilities by deploying their attention and changing their cognition about learning English.

General discussion

This research showed that L2 SC measures were valid and reliable enough to assess five individual SC strategies. In addition, while the

Table 3

Results of T-Tests in the SC Use and Self-Assessed English Proficiency Levels

	Low (<i>n</i> = 530)		High (<i>n</i> = 273)		<i>t</i> (801)	<i>p</i>	Cohen's <i>d</i>
	<i>m</i>	<i>sd</i>	<i>m</i>	<i>sd</i>			
SS	3.05	1.14	3.20	1.20	-1.72	.085	.13
SM	3.26	0.86	3.39	0.78	-2.20	.028*	.16
AD	2.77	0.99	3.20	1.10	-5.67	<.001***	.41
CC	4.06	0.83	4.42	0.70	-6.03	<.001***	.47
RM	3.33	0.85	3.48	0.78	-2.59	.010*	.18

* $p < .05$. *** $p < .001$.

analyses with the newly developed scales revealed various characteristics of Japanese university students' SC strategy use, the emerging picture is rather complicated. This study found (1) that Japanese university students reported the use of CC strategies most frequently; (2) that female students were more likely to use SM strategies than male counterparts; and (3) that high-proficiency learners reported controlling themselves by deploying their attention (AD) and changing their cognition (CC) in L2 learning more than low-proficiency learners.

The keys to understanding these results could be English proficiency level and motivation level. Previous studies (e.g., Dörnyei, Csizér, & Németh, 2006) consistently showed that girls were more motivated than boys in learning English. In addition, female students were more self-disciplined (i.e., self-controlled) than their male counterparts (Duckworth & Seligman, 2006). With these results in mind, this study could claim that because female students were more likely to use SC strategies than male counterparts, they might be more motivated as well. If so, their higher motivation level might mean that they use strategies to adjust their learning situations more effectively to concentrate on

learning. Similarly, with regard to differences in strategy use by learners of different proficiency levels, overall, students in this study were not highly competent in nor motivated to study English and could not take proactive action in choosing or modifying their English learning situations. As a result, it seems that they were forced to face somewhat difficult learning situations, and that relatively high-proficiency learners used cognitive strategies (i.e., AD and CC strategies) more effectively than their less proficient counterparts.

Conclusion

This study is a relatively early study about self-control in the L2 field. It offers several implications for pedagogical practice. First, since SC strategies are effective in L2 learning, teaching strategic SC could be crucial to immediate effects on English proficiency. Second, SC strategy use depends on motivation and L2 proficiency levels, so teaching SC strategies according to these levels would be necessary. Finally, although the SC strategies in this study are L2-specific, the skills involved in such strategies might be transferrable to other academic domains.

There are several limitations to this study. First, because the participants were recruited from one university, diverse samples from other universities will be necessary to generalise the findings. Second, the Cronbach alphas of the factor-analysed measurements are not high enough; the results should be treated with some caution, and further refinement will be needed.

With regard to self-control in academic fields, Duckworth and Seligman (2005) argued as follows:

Underachievement among American youth is often blamed on inadequate teachers, boring textbooks, and large class sizes. We suggest another reason for students falling short of their intellectual

potential: their failure to exercise self-discipline. As McClure (1986) has speculated, “Our society’s emphasis on instant gratification may mean that young students are unable to delay gratification long enough to achieve academic competence” (p. 20). We believe that many of America’s children have trouble making choices that require them to sacrifice short-term pleasure for long-term gain, and that programs that build self-discipline may be the royal road to building academic achievement.

(p. 944)

While they describe educational situations in America, a similar claim can be applicable to language education in Japan. It is important to train competent teachers, develop attractive learning materials, and form good learning environments as external factors. In addition, it is also important to nurture learners’ capacity for internal self-control, or in wider terms “non-cognitive skills” (Heckman, 2013; Taguchi, 2017), in working toward goals.

Notes

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² According to Roever and Phakiti (2019), there is disagreement about whether correlation should be taken into account in calculating the paired-samples *t*-test effect size. In this study, for consistency and simplicity, the correlation value is not integrated into the computation.

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Appendix

SS (Situation Selection)

- (SS1) In English class, I try to study together with those who study English seriously.
- (SS2) I go to places with no TV or books to work on English assignments.
- (SS3) Because there are lots of distractions from studying at home, when I study English, I go to libraries or cafes.
- (SS4) I try to finish English assignments at school.
- (SS5) When I study English, I go to places with no distractions from studying.
- (SS6) When I study for English exams, I avoid meeting my friends.

SM (Situation Modification)

- (SM1) When I study English, if invited out by my friends, I tell them that I will join them when I've finished studying.
- (SM2) When I study English, I place my smartphone out of reach or out of sight.
- (SM3) When TV programs I want to watch are on during my English study, I record them to watch later.
- (SM4) When I study English, I ask close friends to study together with me.
- (SM5) When I study English, I switch off my smartphone.
- (SM6) When studying for English exams, I make up my mind how many times I will go out and study for the rest of the time.
- (SM7) When I have English assignments, I set myself a deadline.
- (SM8) In English class, I sit at the front of the classroom.

AD (Attentional Deployment)

- (AD1) I try to think about my grades or results in English classes and exams when I studied without going out versus when I went out without studying.
- (AD2) During English class, I try to look at the teacher who is speaking or classmates who are giving presentations.
- (AD3) I try to pay attention to English assignments, not to other entertainments like TV or books.
- (AD4) When I study English, I imagine my future situation.
- (AD5) When I study English, I imagine myself using English by looking at photos of and TV programs about foreign countries.
- (AD6) I imagine myself in a situation where I have finished studying English earlier and am doing what I want to do.
- (AD7) I try to remind myself why I am studying English.

CC (Cognitive Change)

- (CC1) I try to think that the class content is relevant to English exams.

- (CC2) I try to think that, even if the task is large, I will be able to complete it by breaking it into smaller, more feasible chunks.
- (CC3) When I study English, I try to think that the exams I am studying for are approaching soon.
- (CC4) I try to think that I can study English during travel time.
- (CC5) I try to think what I am studying now benefits my study.
- (CC6) I promise myself treats if I obtain my target English results/scores.
- (CC7) I try to think that, in English learning, mistakes are chances to improve my English.
- (CC8) When I study for English exams, I try to think that exams will benefit the improvement of my English.

RM (Response Modulation)

- (RM1) I try to direct my will to studying English by, for example, turning down invitations from friends.
- (RM2) With a strong will, I try to not use my smartphone and concentrate on studying in English class.
- (RM3) However attractive other activities are, once I have decided to complete an English assignment, all I need to do is just do it.
- (RM4) I try to work on English assignments no matter what.
- (RM5) I manage to finish my English study which I have made my mind up to do on that day.
- (RM6) Whenever I feel like watching TV or using my smartphone, I try not to touch it so that I can concentrate on English.