

\\ Effects of Difficulties Attaining an Academic Goal and Attractiveness of a Distractor on Academic
Delay of Gratification in University Students

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Abstract

In the academic delay of gratification questionnaire (ADOGQ), we manipulated the difficulty of attaining an academic goal and the attractiveness of a distractor (movie) and set four hypothetical academic delay of gratification situations. In each situation, students were asked whether they would study to attain the academic goal, go to the movie, or were unsure. We investigated the validity of the ADOGQ by administering the Self-Efficacy Scale, Learning Strategy Scale, and Academic Delay of Gratification Scale (ADOGS). The reliability and validity of the ADOGQ were partially confirmed. The main effects of difficulty of attaining the academic goal and attractiveness of the distractor were observed, which supported our hypotheses. The results also indicated the interaction effects between the difficulty of attaining the academic goal and the attractiveness of the distractor.

Key words: academic delay of gratification, delay of gratification, situational factors, self-control

Unfortunately, it is often impractical to translate one's desires, urges, and impulses immediately and directly into action. Often, the behaviors that would be most immediately gratifying are prohibited by a higher authority or society at large. Developing children must learn to wait for a reward that may be forthcoming, but often only after a delay. A key ability for persons is therefore to be capable of delaying gratification (Funder, Block, & Block, 1983).

Mischel (1966, 1974) and his associate conducted research on delay of gratification in which the experimenter presented children with a larger delayed reward available later (DeIR) and a smaller immediate reward available immediately (ImR) and had them choose the one they preferred. When the child selected the DeIR, it was considered that he or she had chosen to delay immediate gratification.

That research indicated that the choice of a delayed reward related positively to social responsibility (Mischel, 1961a), intelligence and achievement motive (Mischel, 1961b), accuracy in time statements (Mischel & Metzner, 1972), and future time perspective (Klineberg, 1968).

Bembenutty and Karabenick (1998) proposed academic delay of gratification (ADOG), defined as a student's postponement of an immediately available opportunity to satisfy an impulse in favor of an academic goal that is temporally remote but ostensibly more valuable. This ability is one of the hallmarks of self-regulated learning. Therefore, ADOG is an important self-regulated behavior that must be acquired in the socialization process (Ogawauchi & Ryu, 2023).

The present study focuses on ADOG. Previous research has indicated that ADOG is related to personal variables such as self-efficacy (Bembenutty, 2007, 2009; Bembenutty & Karabenick, 1998), future time perspective (Klineberg, 1969; Ward, Perry, & Dooling, 1989), and the use of learning strategies (Bembenutty, 2009; Bembenutty & Karabenick, 1998; Ogawauchi & Hamazaki, 2015; Pintrich & De Groot, 1990). However, previous research has not fully investigated the influence of situational factors on ADOG. Thus, it is important to investigate not only personal variables, but also situational factors.

Mitsutomi and Ogawauchi (2017) investigated the effects of situational factors on ADOG in

instruction and learning. The utility value of class, intrinsic value of class, and teacher strictness were manipulated as situational factors. The results indicated that teacher strictness influenced ADOG in the situation where the intrinsic and utility values of the class were low, and that ADOG scores were higher for the high teacher strictness condition (H condition) than for the low teacher strictness condition (L condition). ADOG scores were also the highest in the situation where both the utility and intrinsic values of the class were high.

In Mitsutomi, Ogawauchi, Ryu, and Otsuka (2024), a situation was set in which students must resist the temptation of a distractor (a movie) to attain an academic goal. In setting such a situation, the importance of the academic goal and the attractiveness of the distractor (movie) were used as situational variables to influence ADOG. Here, the distractor refers to the thing (movie) that was an obstacle to goal attainment. The results indicated that the distractor (movie) H condition hindered effective ADOG when the goal importance was low. However, when the goal importance was high, effective ADOG was observed in not only the distractor (movie) L condition, but also the distractor (movie) H condition.

In the present study, we aimed to investigate the effects of situational factors continuously. Mitsutomi et al. (2024) identified the importance of the academic goal and the attractiveness of the distractor (movie) as situational factors and found that the attractiveness of the distractor (movie) influenced ADOG. When the attractiveness of the distractor (movie) was high and therefore a greater obstacle to goal attainment, students were not motivated to study hard and delay gratification. On the other hand, when the attractiveness of the distractor (movie) was low and therefore a lesser obstacle to goal

attainment, students were motivated to study hard and delay gratification. Thus, the attractiveness of the distractor (movie) influenced ADOG.

Therefore, the present study used the attractiveness of the distractor (movie) as a situational factor. In addition, we assessed the difficulty of attaining an academic goal, which was not investigated by Mitsutomi and Ogawauchi (2017) or Mitsutomi et al. (2024).

When attaining the academic goal is difficult, students might be motivated to study harder and delay gratification more successfully. On the other hand, when attaining the academic goal is not very difficult, students might not study harder and delay gratification more successfully. Thus, ADOG scores might be higher in situations where attaining the academic goal is difficult. Therefore, in addition to the attractiveness of the distractor (movie), we also decided to assess the difficulty of attaining an academic goal as a situational factor.

Concretely, a hypothetical situation was set in which students must resist the temptation of a distractor (movie) to attain an academic goal. In this situation, the difficulty of attaining the academic goal and the attractiveness of the distractor (movie) were manipulated and four hypothetical scenarios were devised using a questionnaire we called the ADOGQ. For each situation, students were asked whether they would study to attain an academic goal, go to movie, or were unsure.

However, before we administer the ADOGQ, we have to investigate its validity and reliability. Thus, the first purpose of the present study was to investigate the validity of the ADOGQ. Previous studies (Bembenutty, 2007, 2009, Bembenutty & Karabenick, 1998, 2004, Ogawauchi, Ryu, Mitsutomi & Otsuka,

2013) have investigated the construct validity of the ADOGS by evaluating the relationship between learning strategies, self-efficacy, future time perspective, and ADOG. Therefore, we used learning strategies and self-efficacy to investigate the construct validity of the ADOGQ. We also assessed the concurrent validity of the ADOGQ. In Japan, Ogawauchi, et al (2013) devised the ADOGS. Thus, the concurrent validity was assessed by evaluating the relationship between the ADOGQ scores and scores of ADOGS devised by Ogawauchi, et al (2013)

The second purpose of the present study was to investigate the reliability of the ADOGQ by evaluating test-retest reliability. The third purpose was to investigate the effects of the difficulty of attaining an academic goal and the attractiveness of a distractor (movie) on ADOG. When attaining an academic goal is difficult, students are motivated to study harder and delay gratification more successfully. On the other hand, when attaining an academic goal is not very difficult, students might not study harder and delay gratification more successfully. Therefore, we hypothesized that students would study harder and delay gratification more successfully in a situation where attaining an academic goal was difficult.

We also hypothesized that students would delay gratification more successfully in a situation where the attractiveness of the distractor (movie) was low, which is supported by Mitsutomi et al. (2024). No hypotheses were formulated concerning the interaction effects between the difficulty of attaining an academic goal and the attractiveness of the distractor (movie).

Method

The study participants were 186 university students (60 males, mean age: 18.5 years; 126 females, mean

age: 18.4 years) from the Hyogo district. We asked the students their age, their gender, the name of their university, and the faculty to which they belonged. The students were told that the results of the survey would be analyzed by computer, that the data collected would only be used for the purposes of the study, and that their privacy would be protected. They were also told that the investigator would discard the data after the analysis. Informed consent was obtained from all students before participation.

Questionnaires and scales

Self-Efficacy Scale

Pintrich and De Groot (1990) devised the Self-Efficacy Scale, which was subsequently translated into Japanese by Ogawauchi et al. (2013); this Japanese version was used in the present study. The participants answered the questionnaire items on a six-point scale. To elucidate the factor structure of the Self-Efficacy Scale, factor analysis was performed for males and females. We performed the principal factor analysis with SMC when estimating the commonality. In terms of the changes in eigenvalues and possible interpretability of the factors, we adopted a one-factor solution without factor rotation. As a result, we adopted nine items with a factor loading $\geq .4$. The results are shown in Table 1 (males) and Table 2 (females). The α coefficients were .929 for males and .936 for females.

Learning Strategy Scale

Pintrich and De Groot (1990) devised the Learning Strategy Scale, which Ito (1996) subsequently translated into Japanese, the validity and reliability of which have been confirmed; this Japanese version was used in the present study. The participants answered the questionnaire items on a six-point scale. To

elucidate the factor structure of the Learning Strategy Scale, factor analysis was performed. We performed the principal factor analysis with SMC when estimating the commonality. Factor analysis with promax rotation abstracted three factors each for males and females, considering the changes in eigenvalues and the possible interpretability of the factors.

The first subscale concerns general cognition strategy and consists of eight items for males and nine for females. The α coefficients were .801 for males and .854 for females. The second subscale concerns repeat –summary strategy and consists of six items for males and five for females. The α coefficients were .763 for males and .774 for females. The third subscale concerns attention strategy and consists of four items each for males and females. These items were reversal items. Therefore, the scores of these items were reversed. The α coefficients were .682 for males and .699 for females. The results are shown in Table 3 (males) and Table 4 (females).

ADOQ

We set a hypothetical situation in which the participant had to resist temptation to attain an academic goal. For this situation, we manipulated the difficulty of attaining the academic goal and the attractiveness of the distractor (movie) and set four hypothetical situations, which are shown in Table 5. For the four hypothetical situations, the participants were asked whether they would study to attain the academic goal, go to the movie, or were unsure, and instructed to rate their responses on a three-point scale, where go to the movie was no points, being unsure was one point, and study was two points.

To implement the test–retest method, the ADOQ was conducted on 23 males and 60 females twice,

the second time being 1 month after the first. We had the students write their student ID number on both ADOGQ so that we could examine differences in their responses in the test and retest phases, even though this could lead to privacy concerns. Therefore, we again maintained that their privacy would be protected.

ADOGS

Participants answered the ADOGS devised by Ogawauchi, Ryu, Mitsutomi & Otsuka (2013) on a five-point scale. To elucidate the factor structure of the ADOGS, factor analysis was performed for males and females. We performed the principal factor analysis with SMC when estimating the commonality.

In terms of the changes in eigenvalues and possible interpretability of the factors, we adopted a one-factor solution without factor rotation. As a result, we adopted 14 items with a factor loading $\geq .4$. The results are shown in Table 6 (males) and Table 7 (females). The α coefficients were .905 for males and .926 for females.

Procedure

Self-Efficacy Scale, Learning Strategy Scale, ADOGQ and ADOGS were administered. It took about 15 minutes to complete these scales.

Results

Correlation analysis

For the four situations that manipulated the difficulty of attaining an academic goal and the attractiveness of the distractor, the correlation coefficients between the ADOGS, Learning Strategy Scale, Self-Efficacy Scale, and ADOGQ scores were calculated for males and females.

The results are shown in Table 8 (males) and Table 9 (females). For males, significant positive correlation coefficients were found between scores of ADOGS and delay scores for the four situations and ADOGQ total delay scores. These results suggest that the concurrent validity of the questionnaire is high for males.

On the other hand, for females, significant positive correlation coefficients were observed between ADOGQ scores and the ADOGS scores for the Difficulty L and Attractiveness H, Difficulty H and Attractiveness H, and Total conditions. These results suggest that the concurrent validity of the ADOGQ is also high for females to some degree.

For males, significant positive correlation coefficients were only observed between ADOGQ scores and attention strategy scores for the Difficulty L and Attractiveness H condition. The result suggests that the construct validity is low for males.

On the other hand, for females, significant positive correlation coefficients were found between self-efficacy scores, general cognition strategy scores, repeat–summary strategy scores, attention strategy scores, total learning strategy scores, and ADOGQ delay scores for the Difficulty L and Attractiveness H condition.

Significant positive correlation coefficients were also observed between general cognition strategy scores, repeat –summary strategy scores, total learning strategy scores, and ADOGQ scores for the Difficulty L and Attractiveness L condition.

Furthermore, significant positive correlation coefficients were found between self-efficacy scores,

general cognition strategy scores, repeat –summary strategy scores, the attention strategy scores, total learning strategy scores, and ADOGQ total delay scores. These results suggest that the construct validity is high for females to some degree.

Hierarchical cluster analysis

We investigated the validity of ADOGQ by performing the hierarchical cluster analysis. This analysis clusters the students on the basis of their delay response for the four situations that manipulated the difficulty of attaining the academic goal and the attractiveness of distractor. Euclid distance was used to calculate the distance between samples, and the between-group average linkage method was used as the clustering method.

Six clusters each were abstracted for males and females. To elucidate the characteristics of the clusters, the mean delay scores for the four conditions were calculated for each cluster. The results for males and females are shown in Tables 10 and 11, respectively.

Comparison of total scores for Learning Strategy Scale, Self-Efficacy Scale, and ADOGS among clusters

We compared the total scores for Learning Strategy Scale, Self-Efficacy Scale, and ADOGS among clusters. However, clusters 3–6 were eliminated for males and females because the numbers of samples were small (cluster 3: males, 2, females, 2; cluster 4: males, 4, females, 13; cluster 5: males, 7, females, 2; cluster 6: males, 3, female, 1). Therefore, we used clusters 1 (males, 18, females, 65) and 2 (males, 26, females, 44) and performed the analysis.

Cluster 1 had higher delay scores for the four conditions in which the difficulty of attaining the academic goal and the attractiveness of distractor (movie) were manipulated. Cluster 2 had lower delay scores for the condition in which goal attainment was not very difficult and attractiveness of the distractor was high, but higher delay scores for the remaining three conditions.

Therefore, cluster 1 showed higher ADOG ability than cluster 2. Thus, we called cluster 1 H cluster and cluster 2 L cluster. The Learning Strategy Scale and Self-Efficacy Scale scores were predicted to be higher for H cluster than for L cluster if the construct validity was high. If the concurrent validity was also high, the ADOGS scores were predicted to be higher for H cluster than for L cluster.

Tables 12 and 13 show the total scores for Learning Strategy Scale, Self-Efficacy Scale, and ADOGS for H cluster and L cluster for males and females, respectively. A *t*-test was performed for males and females using the cluster as the independent variable. For males ($t(42) = 2.17, p < .05$) and females ($t(106) = 4.64, p < .01$), H cluster had higher ADOGS scores than L cluster. This result suggests that the concurrent validity of the ADOGQ is high for both males and females.

For females, H cluster also had higher self-efficacy scores ($t(106) = 2.17, p < .05$), higher general cognition strategy scores ($t(106) = 3.51, p < .01$), higher repeat- summary strategy scores ($t(106) = 3.19, p < .01$), higher attention strategy scores ($t(106) = 2.31, p < .05$), and higher total learning strategy scores ($t(106) = 3.85, p < .01$) than L cluster. These results suggest that the construct validity of the ADOGQ is high for females.

Frequency analysis

We calculated the number of male and female students whose retest responses were and were not in agreement with the test responses. Tables 14 and 15 show the results for males and females, respectively. For the Difficulty L and Attractiveness H condition, more test–retest responses were not in agreement for both males and females, which indicated that the reliability is not high for males or females for the Difficulty L and Attractiveness H condition.

However, for the remaining conditions, more test–retest responses were in agreement for males and females, which indicated that the reliability is high for males and females for the other three conditions.

Analysis of variance (ANOVA)

Table 16 shows the mean ADOGQ scores for males and females under each difficulty and attractiveness condition. A 2 (gender) $\times$ 2 (difficulty) $\times$ 2 (attractiveness) ANOVA was performed using the ADOGQ scores as the dependent variable. The main effects of gender ($F(1, 184) = 4.38, p < .05, \eta^2 = .23$), difficulty ($F(1,184) = 101.50, p < .01, \eta^2 = .35$), and attractiveness ($F(1,184) = 155.62, p < .01, \eta^2 = .45$) were significant.

The females had higher ADOGQ scores than males. The Difficulty H condition also had higher ADOGQ scores than the Difficulty L condition. Furthermore, the Attractiveness L condition had higher ADOGQ scores than the Attractiveness H condition.

The interaction effect ($F(1,184) = 84.55, p < .01, \eta^2 = .31$) between difficulty and attractiveness was significant. The simple main effect of difficulty was significant for the Attractiveness H condition ($F(1,370) = 223.16, p < .01, \eta^2 = .54$). The Difficulty H condition had higher ADOGQ scores than the Difficulty L

condition under the Attractiveness H condition. The simple main effect of attractiveness was significant for the Difficulty L condition ($F(1,370) = 275.35, p < .01, \eta^2 = .59$) and the Difficulty H condition ($F(1,370) = 13.35, p < .01, \eta^2 = .07$). The Attractiveness L condition had higher ADOGQ scores than the Attractiveness H condition under the Difficulty H condition and the Difficulty L condition.

Discussion

The primary purpose of the present study was to investigate the construct and concurrent validity of the ADOGQ. Previous studies (Bembenutty, 2007, 2009; Bembenutty & Karabenick, 1998, 2004; Ogawauchi, Ryu, Mitsutomi & Otsuka, 2013) have investigated the construct validity of the ADOGS by evaluating the relationship between self-efficacy, learning strategy, future time perspective, and ADOG. Therefore, we used the Self-Efficacy Scale and Learning Strategy Scale to investigate construct validity. We also investigated concurrent validity by evaluating the relationship between the scores of ADOGS devised by Ogawauchi, et al (2013) and ADOGQ scores.

The results of the correlation analysis indicated that the construct validity was high for females to some degree. Concurrent validity was also high for the females and especially for males. The results of the hierarchical cluster analysis basically indicated similar results. In the present study, we conducted not only correlation analysis, but also hierarchical cluster analysis. We believe that the attempt to investigate the validity of the ADOGQ by performing hierarchical cluster analysis is interesting and important.

The second purpose of the present study was to investigate the reliability of the ADOGQ. The reliability was high for both males and females for all conditions except Difficulty L and Attractiveness H.

Further research is needed to devise an ADOGQ with higher validity and reliability for males and females.

The results of the present study indicated that females had higher ADOG scores than males. This finding is consistent with those of Mitsutomi and Ogawauchi (2017) and Mitsutomi et al. (2024), but inconsistent with those of Ogawauchi et al. (2013).

Girls might have higher self-regulated scores than boys during infancy (Kashiwagi, 1988).

Adolescents that have higher self-regulated scores during infancy might also show higher self-regulated scores in adolescence (Mischel, Shoda, & Peak, 1988). Thus, females who have higher self-regulated scores during infancy might have higher ADOG scores than males. However, Ogawauchi et al. (2013) did not find any gender differences in ADOG. Further research is needed to gain a better understanding of this result. In addition, the reason why girls have higher self-regulated scores than boys during infancy also needs to be investigated. Furthermore, why infancy is an important period for self-regulated behavior requires further study.

Previous studies have focused on personal variables such as self-efficacy (Bembenutty, 2007, 2009; Bembenutty & Karabenick, 1998), future time perspective (Klineberg, 1969; Ward, Perry, & Dooling, 1989), and learning strategy (Bembenutty, 2009; Bembenutty & Karabenick, 1998; Ogawauchi & Hamazaki, 2015; Pintrich & De Groot, 1990), and have investigated the relationships between these personal variables and ADOG. It might be important to focus on not only personal variables, but also situational variables. Therefore, in the present study, we used the difficulty of attaining an academic goal and the attractiveness of a distractor (movie) as situational variables and investigated the effects of these

factors on ADOG. This was the third purpose of the present study.

The difficulty of attaining an academic goal affected ADOG. For the situation in which attaining the academic goal was difficult, students were motivated to study harder and delay gratification. However, for the situation in which attaining the academic goal was not very difficult, students might not study harder and delay gratification. Thus, the Difficulty H condition had higher ADOG scores than the Difficulty L condition. This result supports our hypothesis.

The attractiveness of the distractor (movie) also affected ADOG. In the Attractiveness L condition, the attractiveness of the distractor (movie) that presented an obstacle to goal attainment was low. Therefore, students were motivated to study hard and delay gratification. On the other hand, in the Attractiveness H condition, the attractiveness of the distractor (movie) was high. Therefore, students were not motivated to study hard and delay gratification. Thus, the Attractiveness L condition had higher ADOG scores than the Attractiveness H condition. This result is consistent with Mitsutomi et al. (2024) and supports our hypothesis.

An interaction effect was observed between the difficulty of attaining the academic goal and the attractiveness of the distractor (movie). For the situation in which attaining an academic goal was difficult, students are motivated to study hard and delay gratification when the attractiveness of the distractor is low. Although the delay score was significantly lower for the attractiveness H than for the attractiveness L condition, the delay scores under the attractiveness H condition did not differ largely from those under the attractive L condition. Thus, for the situation in which attaining the academic goal was difficult, students

are motivated to study hard and delay gratification even when the attractiveness of the distractor was high.

However, even in the situation in which attaining the academic goal was not very difficult, students are motivated to study hard and delay gratification more successfully when the attractiveness of the distractor (movie) was low. On the other hand, for the situation in which attaining the academic goal is not very difficult, the delay scores were significantly lower under the attractiveness H than under the attractiveness L condition. That is, for the situation in which attaining the academic goal was not very difficult, students might not study harder and delay gratification when the attractiveness of the distractor (movie) was high.

In summary, for the situation in which attaining an academic goal was difficult, students were motivated to study hard and delay gratification even when the attractiveness of the distractor (movie) was high. On the other hand, for the situation in which attaining the academic goal was not very difficult, the delay scores under the Attractiveness H condition differed largely from those under the Attractiveness L condition. In the Attractiveness H condition, students might not study harder and delay gratification more successfully. However, in the Attractiveness L condition, students were motivated to study hard and delay gratification more successfully.

The results of the present study suggest that situational factors influence ADOG, similar to the findings of Mitsutomi and Ogawauchi (2017) and Mitsutomi et al. (2024). We continuously identify various situational factors that need to be investigated in terms of their effects on ADOG. Previous research has focused on personal variables such as self-efficacy (Bembenutty, 2007, 2009; Bembenutty & Karabenick, 1998), learning strategies (Bembenutty, 2009; Bembenutty & Karabenick, 1998; Pintrich & De Groot,

1990), and future time perspective (Klineberg, 1969; Ward, Perry & Dooling, 1989), and investigated the relationships between these personal variables and ADOG. By contrast, the present study investigated the relationship between situational factors and ADOG. The interaction effects between personal and situational variables on ADOG should be investigated in future research.

In conclusion, the results of the present study partially confirmed the construct validity, concurrent validity, and reliability of the ADOGQ. Main effects of the difficulty of attaining an academic goal and the attractiveness of the distractor (movie) were also observed. These results supported our hypotheses. Furthermore, the results indicated interaction effects between the difficulty of attaining the academic goal and the attractiveness of the distractor.

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Table 1 Results of the factor analysis (males)

	F1	Commonality
I can get a good mark.	.70	.49
I can do well in class.	.78	.62
I can solve the tasks and problems given in class.	.72	.51
I can understand the contents of the class.	.79	.63
I can keep up with the level of the class.	.80	.65
I know the contents of the class better than the other students.	.85	.73
I can do better than the other students.	.86	.75
I am better at learning than the other students.	.85	.72
I have a higher learning ability than the other students.	.82	.67
Eigenvalue	5.78	
Proportion of variance	64.27	
Cumulative variance	64.27	

Table 2 Results of the factor analysis (females)

	F1	Commonality
I can get a good mark.	.77	.60
I can do well in class.	.85	.72
I can solve the tasks and questions given in class.	.79	.62
I can understand the contents of the class.	.80	.64
I can keep up with the level of the class.	.77	.60
I know the content of the class better than the other students.	.78	.60
I can do better than the other students.	.89	.79
I am better at learning than the other students.	.89	.80
I have a higher learning ability than the other students.	.74	.55
Eigenvalue	5.96	
Proportion of variance	66.26	
Cumulative proportion	66.26	

Table 3 Results of the factor analysis (males)

	F1	F2	F3	Commonality
When I study for a test, I attempt to remember more interesting content.	.75	.34	.31	.63
When I study for a test, I collect clues from the class and book.	.67	.38	.23	.49
When I do homework, I replace the difficult terms with easy ones.	.66	.06	-.06	.51
When I study for a test, I review the important points repeatedly and memorize them.	.70	.27	-.04	.51
Even if the learning task is boring and uninteresting, I continue to perform.	.54	.33	-.02	.31
When I read the learning content, I think about it repeatedly so that I can remember it.	.62	.20	-.17	.43
When I read something, I relate it to things I already know.	.58	.26	-.41	.55
I utilize the things that I have previously learned when I perform a novel task.	.47	.31	-.41	.46
Even if I cannot understand, I attempt to comprehend the learning contents that teacher gives in class.	.51	.68	.23	.53
When I do homework, I remember the learning content that the teacher gives in class so that I can answer the question.	.57	.69	.42	.65
When I read, I interrupt and repeat the learning task.	.33	.75	.05	.57
Even when it is not required, I do the exercise.	.12	.56	.00	.34
I summarize my notes so that I can remember the learning content.	.49	.70	.26	.55
I summarize the points of the learning content so that I can understand them better.	.10	.52	-.10	.35
It is difficult to understand what is written when I read the textbook during class.	-.10	.03	.73	.55
It is difficult to understand what the important points are when I read the textbook.	.02	-.26	.65	.61
When the task is difficult, I either give up or do an earlier task instead.	.13	.34	.56	.38
When the teacher is lecturing, I think about other things and do not listen.	.09	.49	.66	.60

Eigenvalue	4.78	2.65	1.66
Proportion of variance	26.60	14.74	9.25
Cumulative proportion	26.60	41.34	50.59

Table 4 Results of the factor analysis (females)

	F1	F2	F3	Commonality
When I study for a test, I attempt to remember more interesting content.	.71	.66	.09	.68
When I study for a test, I collect clues from the class and book.	.77	.65	-.06	.71
When I do homework, I replace the difficult terms with easy ones.	.68	.62	.06	.60
When I study for a test, I review the important points repeatedly and memorize them.	.58	.30	-.13	.37
Even if the learning task is boring and uninteresting, I continue to perform.	.71	.58	.05	.59
When I read the learning content, I think about it repeatedly so that I can remember it.	.69	.29	-.03	.49
When I read something, I relate it to things I already know.	.53	.35	-.13	.32
I utilize the things that I have previously learned when I perform a novel task.	.62	.01	.26	.53
Even if I cannot understand, I attempt to comprehend the learning contents that teacher gives in class.	.69	.09	.35	.64
When I do homework, I remember the learning content that the teacher gives in class so that I can answer the question.	.56	.69	.09	.57
When I read, I interrupt and repeat the learning task.	.28	.73	.02	.55
Even when it is not required, I do the exercise.	.11	.67	-.14	.50
I summarize my notes so that I can remember the learning content.	.46	.66	.09	.48
I summarize the points of the learning content so that I can understand them better.	.39	.70	.13	.50
It is difficult to understand what is written when I read the textbook during class.	.05	.11	.80	.67
It is difficult to understand what the important points are when I read the textbook.	.22	.00	.77	.64
When the task is difficult, I either give up or do an earlier task instead.	.08	.49	.59	.58
When the teacher is lecturing, I think about other things and do not listen.	.19	.50	.51	.47

Eigenvalue	6.16	2.10	1.68
Proportion of variance	34.25	11.67	9.37
Cumulative proportion	34.25	45.93	55.30

Table 5 ADOGQ

Difficulty (L) and Attractiveness (L) condition

You are trying to study to earn credits for a subject. Earning credits for this subject is not very difficult. A movie that you do not really want to see is currently playing. Do you study hard, go to see the movie or unsure when earning the credits is not really difficult ?

Go to the movie

Unsure

Study

Difficulty (L) and Attractiveness (H) condition

You are trying to study to earn credits for a subject. Earning credits for this subject is not very difficult. A movie that you desperately want to see is currently playing. Do you study hard, go to see the movie or unsure when earning the credits is not very difficult ?

Go to the movie

Unsure

Study

Difficulty (H) and Attractiveness (L) condition

You are trying to study to earn credits for a subject. Earning credits for this subject is difficult. A movie that you do not really want to see is currently playing. Do you study hard, go to see the movie or unsure when earning the credits is difficult ?

Go to the movie

Unsure

Study

Difficulty (H) and Attractiveness (H) condition

You are trying to study to earn credits for a subject. Earning credits for this subject is difficult. A movie that you desperately want to see is currently playing. Do you study hard, go to see the movie or unsure when earning the credits is difficult ?

Go to the movie

Unsure

Study

Table 6 Results of the factor analysis (males)

	F1	Commonality
I prioritize studying and work hard to actualize my dream.	.54	.29
I do not pursue pleasure that is available immediately and study hard for the future.	.70	.50
Even if I am confronted with pleasure available immediately, I continue studying.	.68	.47
I ignore pleasure that is available immediately and stay absorbed in studying.	.67	.45
Even if I encounter a problem, I do not give up and study hard.	.65	.43
I keep the goal of studying in mind in daily life.	.60	.36
I defer pleasure that is available immediately until later and study hard.	.67	.45
When I have a test or homework, I study hard and delay gratification until I have finished the test or homework.	.75	.57
I study hard for my course and employment.	.81	.66
I resist temptation from friends and study hard when I have a test or homework.	.69	.48
I keep my perspective on the future and study hard.	.56	.31
I resist the desire to play and study hard when I have a test or homework.	.67	.45
Even if I am confronted with pleasure that is available immediately, I study hard.	.76	.57
I do not allow myself to become lazy and study hard.	.58	.33
Eigenvalue	6.39	
Proportion of variance	45.64	
Cumulative proportion	45.64	

Table 7 Results of the factor analysis (females)

	F1	Commonality
I prioritize studying and work hard to actualize my dream.	.56	.31
I do not pursue pleasure that is available immediately and study hard for the future.	.69	.48
Even if I am confronted with pleasure available immediately, I continue studying.	.71	.51
I ignore pleasure that is available immediately and stay absorbed in studying.	.69	.47
Even if I encounter a problem, I do not give up and study hard.	.76	.58
I keep the goal of studying in mind in daily life.	.77	.60
I defer pleasure that is available immediately until later and study hard.	.69	.47
When I have a test or homework, I study hard and delay gratification until I have finished the test or homework.	.70	.49
I study hard for my course and employment.	.79	.63
I resist temptation from friends and study hard when I have a test or homework.	.62	.38
I keep my perspective on the future and study hard.	.72	.52
I resist the desire to play and study hard when I have a test or homework.	.74	.54
Even if I am confronted with pleasure that is available immediately, I study hard.	.82	.67.
I do not allow myself to become lazy and study hard.	.70	.50
Eigenvalue	7.21	
Proportion of variance	51.51	
Cumulative proportion	51.51	

Table 8 Correlation with delay scores for each situation and total delay scores across situations (males)

	Self- efficacy	General cognition	Repeat Summary	Attention	Total learning strategy	ADOGS
Difficulty L Attractiveness L	.07	.04	.01	.19	.13	.31*
Difficulty L Attractiveness H	.21	.09	.15	.26*	.22	.44**
Difficulty H Attractiveness L	.00	-.17	-.01	-.15	-.06	.27*
Difficulty H Attractiveness H	-.02	-.11	.16	.14	.05	.46**
Total ADOGQ scores	.10	-.03	.12	.25	-.13	.50**

Note. *P <.05 ** P <.01

Table 9 Correlation with delay scores for each situation and total delay scores across situations (females)

	Self- efficacy	General cognition	Repeat Summary	Attention	Total learning strategy	ADOGS
Difficulty L Attractiveness L	.09	.21*	.21*	.07	.22*	.12
Difficulty L Attractiveness H	.28**	.31**	.33**	.24**	.36**	.51**
Difficulty H Attractiveness L	.05	-.01	-.04	.05	-.00	-.03
Difficulty H Attractiveness H	.05	.04	.01	.16	.07	.27**
Total ADOGQ scores	.22*	.27**	.25**	.23**	.31**	.44**

Note. * $P < .05$ ** $P < .01$

Table 10 Results of the hierarchical cluster analysis (males)

	Difficulty L Attractiveness L	Difficulty L Attractiveness H	Difficulty H Attractiveness L	Difficulty H Attractiveness H
Cluster 1	1.96 (.19)	1.69 (.47)	2.00 (.00)	2.00 (.00)
Cluster 2	1.94 (.22)	.00 (.00)	2.00 (.00)	2.00 (.00)
Cluster 3	2.00 (.00)	1.50 (.70)	1.50 (.70)	.00 (.00)
Cluster 4	1.25 (.50)	.50 (.57)	.75 (.50)	1.00 (.00)
Cluster 5	1.28 (.75)	.00 (.00)	2.00 (.00)	.28 (.48)
Cluster 6	.00 (.00)	.00 (.00)	.00 (.00)	.00 (.00)

Note. () is SD

Table 11 Results of the hierarchical cluster analysis (females)

	Difficulty L Attractiveness L	Difficulty L Attractiveness H	Difficulty H Attractiveness L	Difficulty H Attractiveness H
Cluster 1	2.00 (.00)	2.00 (.00)	2.00 (.00)	2.00 (.00)
Cluster 2	1.80 (.50)	.38 (.49)	1.98 (.12)	2.00 (.00)
Cluster 3	1.00 (.00)	.50 (.70)	1.00 (.00)	1.00 (.00)
Cluster 4	1.84 (.37)	.07 (.27)	2.00 (.00)	.46 (.51)
Cluster 5	1.50 (.70)	2.00 (.00)	1.50 (.70)	.00 (.00)
Cluster 6	.00 (.00)	.00 (.00)	.00 (.00)	.00 (.00)

Note. () is SD

Table 12 Comparison of total scores for Self-Efficacy scale, Learning Strategy Scale, and ADOGS
among clusters (males)

	Self- efficacy	General cognition	Repeat Summary	Attention	Total learning strategy	ADOGS
H cluster	33.00 (8.52)	35.50 (7.14)	23.57 (5.04)	14.03 (3.51)	72.76 (13.68)	49.73 (8.84)
L cluster	29.50 (8.38)	35.38 (3.83)	23.77 (4.89)	12.72 (4.28)	71.83 (8.56)	44.44 (8.28)

Note. () is SD

Table 13 Comparison of total scores for Self-Efficacy scale, Learning Strategy Scale, and ADOGS among clusters (females)

	Self- efficacy	General cognition	Repeat Summary	Attention	Total learning strategy	ADOGS
H cluster	32.34 (8.46)	42.90 (6.49)	21.68 (4.20)	15.20 (4.01)	79.79 (11.92)	52.97 (7.59)
L cluster	29.04 (9.05)	38.62 (7.47)	19.00 (5.25)	13.65 (3.80)	71.12 (13.75)	45.81 (9.73)

Note. () is SD

Table 14 Results of the analysis of reliability (males)

	Number of consistent students	Number of inconsistent students
Difficulty L Attractiveness L	17	6
Difficulty L Attractiveness H	12	11
Difficulty H Attractiveness L	21	2
Difficulty H Attractiveness H	19	4

Table 15 Results of the analysis of reliability (females)

	Number of consistent students	Number of inconsistent students
Difficulty L Attractiveness L	45	15
Difficulty L Attractiveness H	28	32
Difficulty H Attractiveness L	53	7
Difficulty H Attractiveness H	50	10

Table 16 Mean academic delay scores for each condition

	Difficulty L		Difficulty H	
	Attractiveness L	Attractiveness H	Attractiveness L	Attractiveness H
Males	1.73 (.57)	.81 (.89)	1.80 (.54)	1.56 (.76)
Females	1.84 (.44)	.93 (.89)	1.95 (.24)	1.77 (.57)

Note. () is SD