The effect of goal attainability on conserving regulatory resources

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目標の達成可能性が制御資源の節約に与える影響

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要約

人々は日常的に、複数の目標を同時に追求している。他方、目標達成に必要な制御資源は有限であることから、それぞれの目標に対して十分な労力を常に投入できるとは限らない。先行研究では、2 つの目標を連続して遂行するとき、後続の目標の達成が難しいほど、その目標に向けて制御資源が節約されることが示されてきた。他方、動機づけ強度理論に基づくと、後続の目標の達成が極めて困難であり、達成が不可能と認知されると、その目標に対して制御資源は節約されなくなると予測される。この予測を検証するため、本研究では 38 名の大学生を対象とした実験室実験をおこなった。実験でははじめに、2 つの異なる認知課題（ストループ課題・数字暗記課題）を順番におこなうと説明した。その際、後続の課題（数字暗記課題）の内容に関する教示を変えることでその課題の達成可能性の高低を操作し、先行の課題（ストループ課題）の遂行が変化するかを検証した。結果、数字暗記課題の達成可能性が低い（不可能）条件の参加者は、統制条件の参加者と比べて、ストループ課題の遂行が有意に高いことが示された。すなわち、後続の目標の達成が不可能だと認知されると、先行の目標の遂行において制御資源は節約されないという、動機づけ強度理論の予測に整合する結果が得られた。考察では、目標競合時の自己制御に対する介入方略の可能性や本研究における限界について議論した。

Key words
self-regulation, motivation intensity theory, goal pursuit, regulatory resource, willpower

1. Introduction

1.1 Social consequences of self-regulation

In everyday life, people coordinate their behaviors and cognition in order to attain various goals. For example, people on a diet eat low-calorie foods (e.g., vegetables) resisting temptations to eat higher-calorie but preferable foods (e.g., cakes). This psychological process is called self-regulation (Carver & Scheier, 2016). It is closely related to a wide range of social behaviors and promotes social fit to everyday life. Concretely, previous research has shown that people with high self-regulation ability indicate superior performance in both academic and workplace environments and are less likely to procrastinate and conduct deviant behaviors (De Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). Additionally, people who are demotivated to exert self-regulation tend to behave more aggressively and less cooperatively (Inzlicht & Schmichel, 2012). Thus, it is essential to reveal the self-regulatory mechanisms for exerting sufficient self-regulation in various domains of social situations, as these will then lead to better social life.

1.2 Regulatory resource model

Although self-regulation fulfills a key role in everyday life, people do not always exert sufficient levels of it. Research based on the regulatory resource model (Baumeister, 2014; Baumeister, Bratslavsky, Muraven, & Tice, 1998; Muraven, Tice, & Baumeister, 1998) has demonstrated that exerting self-regulation depends on limited psychological resources (i.e., regulatory resources). According to this model, once people exert self-regulation, they consume regulatory resources, thus leaving them in a state of “ego depletion” which results in self-regulation failure in a subsequent goal.

Baumeister et al. (1998) invited hungry participants to an experiment room filled with a scent of delicious chocolate chip cookies. Participants were seated at a table on which there were two bowls: one full of cookies and another filled with radishes. Participants were randomly assigned to either a depletion or control condition. While participants in the control condition were asked to eat cookies as part of a tasting experiment, those in the depletion condition were asked to eat radishes. This research assumed that participants who ate radishes needed to resist an impulse to eat the delicious cookies, which would deplete their regulatory resources. After this manipulation, participants completed an unsolvable puzzle. As a result, consistent with their hypotheses, the amount of time invested in this puzzle was less in the depletion condition than in the control condition.

This result suggests that participants who ate radishes consumed their own regulatory resources because they suppressed the temptation to eat cookies, which led to less persistence

in the puzzle. Additionally, the result that two different tasks shared regulatory resources implies that these resources are not only limited, but common across a different domain of self-regulations. In fact, existing research has found that ego depletion arises by exerting various self-regulations such as controlling impulses, attentions, emotions and, cognitive processing (Hagger, Wood, Stiff, & Chatzisarantis, 2010).

1.3 Conservation of regulatory resources

People do not always pursue a single goal at any one point. Often people are intending to attain multiple goals at one time (Masicampo & Baumeister, 2011a, 2011b). In such a situation, these multiple goals are likely to compete for limited regulatory resources (Marien, Custers, Hassin, & Aarts, 2012; Shah & Kruglanski, 2002). For example, when people are pursuing two goals consecutively, they conserve their own regulatory resources for the subsequent goal which is difficult to attain (Janssen, Fennis, & Pruyn, 2010; Muraven, Shmueli, & Burkley, 2006; Tyler & Burns, 2009). Consequently, while the performance in the precedent goal would decrease, performance in the subsequent goal would increase.

Muraven et al. (2006) instructed participants to successively complete two tasks, the first of which was a Stroop task and second of which was an anagram task. When experimenters explained the anagram task, they manipulated the perception of difficulty in this task. Concretely, while participants in the difficult condition were instructed to resist their own impulses during the anagram task, those in the control condition were not given such an instruction. Following this, all participants conducted the Stroop task followed by the anagram task. Results showed that participants in the difficult condition showed worse performance in the Stroop task, and better performance in the anagram task. In contrast, participants in the control condition did not indicate this pattern of performance. These results implied that when people pursued two goals at once and perceived the subsequent goal as difficult to accomplish, they were likely to conserve their own regulatory resources for its attainment.

1.4 Motivation intensity theory

Existing research assumes that the extent to conserve regulatory resources increases monotonically with the subsequent-goal difficulty. That is, the more difficult people perceive a goal to be, the more regulatory resources they will conserve. However, will people conserve their regulatory resources even when they perceive that a subsequent goal is extremely difficult and thus impossible to attain?

Motivation intensity theory (Brehm & Self, 1989; Gendolla, Wright, & Richter, 2012; Wright, 2008) can provide an answer to this question. According this theory, people invest their own effort (interchangeable with regulatory resources) in a goal pursuit based on the "law of parsimony" which leads people not to waste effort. More specifically, this law makes people increase investment of effort in proportion to the goal difficulty unless people perceive the goal is too difficult to attain.

For instance, Roets, Van Heil, Cornelis, & Soetens (2008) asked participants to answer the number (from 1 to 6) which would be presented on the screen. Varying the time of presenting numbers, the experimenters manipulated the task difficulty. The results showed that while participants invested more effort in this task, which was difficult but possible to complete, than the one that was either too easy or impossible to complete. That is, participants invest their own effort in this task based on the law of parsimony.

1.5 Present research

Previous research based on the motivation intensity theory has focused on situations where people are pursuing a single goal. Does the motivation intensity theory apply to the case of multiple-goal pursuits? This research intended to answer this question by testing whether people conserve their own regulatory resources based on the law of parsimony. More specifically, we tested whether the attainability of a subsequent goal would cause the conservation of regulatory resources when people were pursuing two goals successively. We predicted that participants who perceived the subsequent goal as unattainable would conserve less regulatory resources for its accomplishment than those who perceived the goal to be difficult but attainable, which would result in higher performance in the precedent goal. In order to test this prediction, we conducted one experiment in the laboratory.

2. Methods

2.1 Participants

Thirty-eight students at the University of Tokyo participated in this experiment in exchange for a ¥1,000 book card (21 males, 16 females, and 1 not reported; $Mage$ = 20.84, SD = 0.73). Participants were randomly assigned to either an impossible condition (n = 18) or control condition (n = 20). Written informed consent from all participants was obtained in advance.

2.2 Procedure

Participants completed almost all the procedure on a computer in a sound booth. All answers to questions were measured on 5-point scale (from 1 "not at all" to 5 "very").

All participants were informed that they would complete two separate tasks measuring several cognitive abilities. The first task was a Stroop task and the second task was a number-memory task. The Stroop task asked participants to name the color of a word as quickly and accurately as possible. The number-memory task required participants to memorize the number on the screen within 10 seconds. Participants were told they would receive the feedback about their scores on these tasks at the end of the experiment in order to represent goals to achieve high scores on each task. However, this instruction was decep-

tive, as the number-memory task was not conducted.

In the instruction of the number-memory task, we manipulated the goal attainability. Concretely, while participants in the impossible condition were told to memorize a 100-digit number (an impossible task), those in the control condition were instructed to memorize a 10-digit number (a difficult but possible task). After this manipulation, all participants answered how impossible (reverse-scored) and difficult the number-memory task was in order to check whether this manipulation was sufficiently achieved. In addition, participants completed the Japanese version of Positive and Negative Affect Schedule (PANAS) scales (Sato & Yasuda, 2001) for eliminating the possibility that the manipulation of goal attainability would influence positive and negative affect, which in turn would affect performance on the Stroop task.

Afterwards, participants completed the Stroop task. The Stroop task consisted of two types of trials: a congruent trial and incongruent trial. While the congruent trial was presented with the color of the word matching its meaning (e.g., "RED" written in red), the incongruent trial was presented with the color of the word mismatching its meaning (e.g., "RED" written in blue). Participants randomly conducted these trials 32 times each.

None of the participants was aware of our true hypothesis and the objectives of the research. All participants were fully debriefed and thanked for their participation.

3. Results

3.1 Preliminary analysis

In order to check whether goal attainability was sufficiently manipulated, we conducted an unpaired *t*-test with the reported goal attainability. This analysis revealed that participants in the impossible condition (M = 1.33, SD = 0.97) perceived the number-memory task as less attainable than those in the control condition (M = 3.30, SD = 1.03; t (36) = 6.04, $p < .001$). In addition, we conducted one-sample t tests comparing the mean of the reported goal attainability in each condition with the theoretical midpoint (i.e., 3). This analysis indicated that while the mean in the impossible condition was significantly below the midpoint (t (17) = 7.29, $p < .001$), the one in the control condition was not (t (19) = 1.30, p = .21). These results suggest that the manipulation was sufficiently conducted.

We conducted an unpaired t-test with reported difficulty of the number-memory task. As a result, there was no significant difference between the impossible condition (M = 4.67, SD = 0.97) and control condition (M = 4.25, SD = 0.97; t (36) = 1.33, p = .19). However, this result was assumed to be due to the ceiling effect.

In order to eliminate the alternative explanation that the manipulation in this experiment would change the participants' affects, which in turn would influence the performance on the Stroop task, we tested whether the manipulation influenced positive affect (8 items; Cronbach's α = .84) and negative affect (8 items; Cronbach's α = .88), which were subscales of PANAS. The results of unpaired t-tests showed no significant differences between the impossible condition (positive affect: M = 2.47, SD = 0.83; negative affect: M = 2.49, SD = 1.03) and control condition (positive affect: M = 2.57, SD = 0.54; t (36) = 0.43, p = .67/ negative affect: M = 2.07, SD = 0.74; t (36) = 1.45, p = .16), which was supposed to eliminate the possibility of the alternative explanation by both affects.

3.2 Main analysis

Prior to the hypothesis testing, we calculated the Stroop effect as an indicator of performance in the Stroop task. This score was calculated by dividing the difference between the mean response times in the congruent trial and incongruent trial by pooled standard deviation of response times in both trials. The lower score of the Stroop effect, the better the performance in the Stroop task. In order to eliminate outliers, as a precaution, we removed the trials in which participants made errors and mean response time ± 3 SD in each participant. We conducted an unpaired t-test with the Stroop effect. The results showed that the Stroop effect in the impossible condition (M = 0.10, SD =

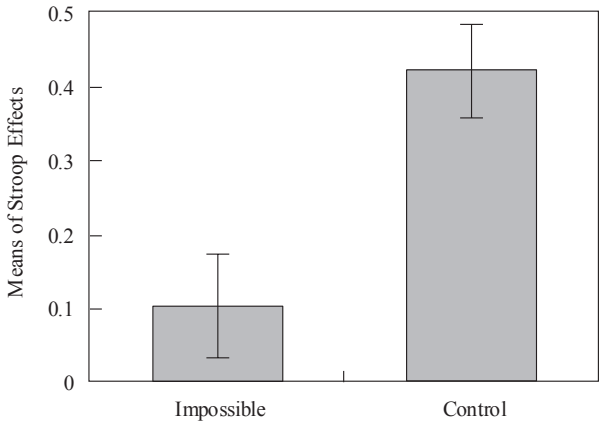

Figure 1: Means of Stroop effects in the two conditions
Note: Error bars represent standard errors.

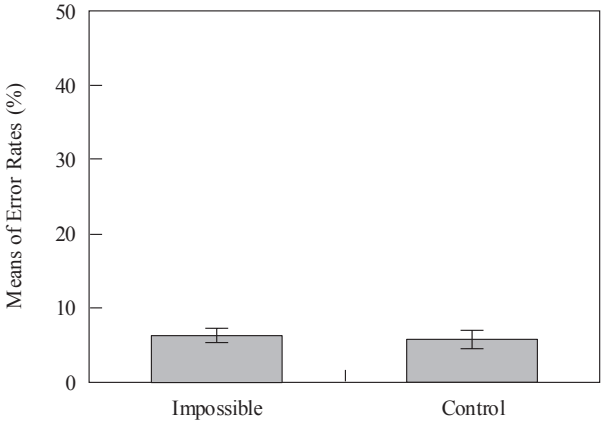

Figure 2: Means of error rates in the two conditions
Note: Error bars represent standard errors.

0.30) was lower than that in the control condition (M = 0.42, SD = 0.29; t (36) = 3.38, p = .002; Figure 1). That is, performance in the Stroop task in the impossible condition was higher than that in the control condition. Confirming our prediction, this result implies that when participants perceive the attainability of the subsequent task is low, they will not conserve their regulatory resources, which in turn might lead to the higher performance in the precedent task. We also conducted an unpaired t-test with error rates of the Stroop task. The analysis revealed no significant difference between participants in the impossible condition (M = 6.25, SD = 3.98) and those in the control condition (M = 5.78, SD = 5.51; t (36) = 0.30, p = .77; Figure 2), which however, were supposed to suggest the floor effect.

4. Discussion

This study tested whether people would conserve their own regulatory resources based on the law of parsimony. More specifically, we tested whether, in a situation where people were pursuing two separate goals sequentially, manipulating the attainability of the subsequent goal would influence the occurrence of conserving regulatory resources. Consequently, participants who perceived that the subsequent task (number-memory task) was impossible to attain, showed better performance in the precedent task (Stroop task) than those who perceived the subsequent task to be difficult but possible to attain. This result confirmed our prediction in suggesting that participants in the impossible condition did not conserve their own regulatory resources in comparison to those in the control condition.

4.1 Implications

Based on the motivation intensity theory, we applied the law of parsimony to self-regulations in goal competition. Given that most people intend to accomplish more than one goal in daily life, this research has implications for clarifying the regulatory-resource conservation in a form closer to the real world.

The results suggest several interventions for facilitating successful self-regulations. One possibility is that varying expectancies and values of goal attainment can inhibit the conservation of regulatory resources. For example, psychological interventions which will change expectancy- value beliefs about deliberate effort to attain difficult goals (e.g., to solve a complex math problem) have been found to facilitate goal achievement (Eskreis-Winkler et al., 2016). These interventions have increased expectancies by highlighting the efficacy of effort in goal pursuits and values by altering the interpretation about cost and frustration during challenging practices. The results imply that people can invest more regulatory resources in the following goal by altering their own expectancy-value beliefs about this goal, especially by increasing its expectancy (i.e., attainability).

The existing research demonstrated that perceived goal attainability can be influenced by the extent to which people perceive their remaining regulatory resources (c.f., Muraven et al., 2006). Therefore, future interventions could alter beliefs about regulatory resources in order to restrain conservation of regulatory resources. Previous research based on the implicit theory of willpower (Job, Dweck, & Walton, 2010) demonstrated that whether people perceive that willpower (interchangeable with regulatory resources) is limited or unlimited affects their self-regulation performance. For example, it was found that people who were primed with the unlimited theory of willpower did not decrease their performance in the self-regulation task even after the depleting task (Job et al., 2010) and, people who have the unlimited theory of willpower were likely not to procrastinate in the situation demanding high self-regulation (Job, Walton, Bernecker, & Dweck, 2015). Thus, priming people with the unlimited theory of willpower may lead them to invest their regulatory resources, even in the less attainable goals.

4.2 Limitations

We recognize several limitations of this research. Firstly, we did not directly test whether conserving regulatory resources truly decreased performance on the Stroop task. Thus, this study may have some alternative accounts for the results. One possibility is that participants in the impossible condition might have considered the number-memory task was too difficult and so unlikely to be conducted, although no participants suspected the procedure of this experiment. Thus, these participants might exert all their strength in the first Stroop task, which leaves them better off than those in the control condition. In order to solve this problem, we should compare performance on a subsequent task that will have the same content between conditions in the experiment. Such an experiment predicts that participants in the difficult but attainable condition will perform better in the following goal than those in the unattainable condition because they will conserve their own regulatory resources for the following goal. This experiment need not alter the contents of the subsequent task but manipulate the instruction about this task (c.f., Muraven et al., 2006).

Secondly, it is unclear whether all participants in this study truly represent the goal in that they intended to get higher scores in both the tasks. This experiment suggested that the feedback received by participants about their performance on two tasks was supposed to function as an incentive to perform well, but this is only a speculation. Monetary rewards to participants depending on their performance would be one way to increase motivation to complete the task (Muraven & Slessareva, 2003). Another way is to focus on performance on an idiosyncratic goal (e.g., dieting goal) that people have already represented before the experiment (Fishbach & Dar, 2005). Using these procedures, future research must clarify that performance on the cognitive task is really the consequence of goal pursuit.

Finally, this research has low ecological validity because the experiment was conducted in a laboratory. Therefore, the par-

ticipants may exhibit suspicion that they would not demonstrate in the everyday life. On this point, in recent years, experience sampling methods are emerging mainly in the domain of social psychology (Hofmann, Wisneski, Brandt, & Skitka, 2014). This method requires participants outside of the laboratory to answer questions when they receive signals sent on their own smart phone. Compared with normal experiments and surveys, these data have less recall bias and thus more ecological validity because they record moods and behaviors here and now. Experience sampling methods enable us to test whether people conserve regulatory resources in the real world and if this conservation is based on the law of parsimony, which may have highly practical implications.

4.3 Conclusion

In everyday life, people pursue multiple goals at one time. However, regulatory resources are limited, so self-regulation research has to detangle how people allocate their own resources for each goal. Based on this interest, our research demonstrated that in the situation of goal competition, people were unlikely to conserve their own regulatory resources when they perceived the subsequent goal to be impossible to attain. Given that most self-regulation literature has tested how people pursue single, not multiple, goals, this research has theoretical implications for identifying goal attainability as a new predictor of conserving regulatory resources. Future research needs to establish a more comprehensive model of self-regulation and develop a more effective intervention leading to enhanced self-regulatory behaviors.

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