博士論文

# Adaptive Roles of Self-focused Attention in Relation to Depression

(抑うつとの関連における自己注目の適応的役割)

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# Chapter 1: Introduction

## 1.1. Depression

### 1.1.1. Depression: definition and terminology

Depression is a psychiatric disorder characterized by various symptoms including a change in mood, suicidal ideation, somatic changes, and increased self-focused attention (Beck, Steer, & Brown, 1996; Beck & Alford, 2009; Smith & Greenberg, 1981). Major depressive disorder (MDD) is one of most widespread mental illnesses. Its lifetime prevalence rate is approximately 16% in the USA (Kessler, Berglund, Demler, Jin, Koretz et al., 2003; Kessler, Petukhova, Sampsom, Zaslavsky, & Wittchen, 2012) and approximately 6% in Japan (Kawakami, 2006). The term "depression" has also become a common word in everyday life. Researchers who study depression should note that this term has varied meanings among the public including (a) depressed mood, (b) depressive symptoms, and (c) depression as a mental disorder or depressive disorder including MDD (Sakamoto, 1997; Figure 1-1). Depressed mood is an emotional state that people often experience during daily life with or without depressive disorders. Depressive symptoms are a group of symptoms comprising a depressed mood and the experience of mental and physical symptoms. These symptoms include a negative self-concept, somatic changes such as sleep disturbance and change in weight, loss of interest, and suicidal ideation. Depressive symptoms-like experiences (i.e. non-clinical or mild depressive symptoms) can be also observed among individuals without depressive disorders. These are common experiences and not necessarily maladaptive if they are short-lived. However, when they continue beyond a certain period and become more severe, an individual may be diagnosed with depressive disorders (e.g., Diagnostic and Statistical Manual of Mental Disorders 5th ed.; American Psychiatric Association, 2013).

This terminology is important for clarifying what studies examine, such as short-term change mood states, therapeutic effects, or how individuals with non-clinical levels of depressive

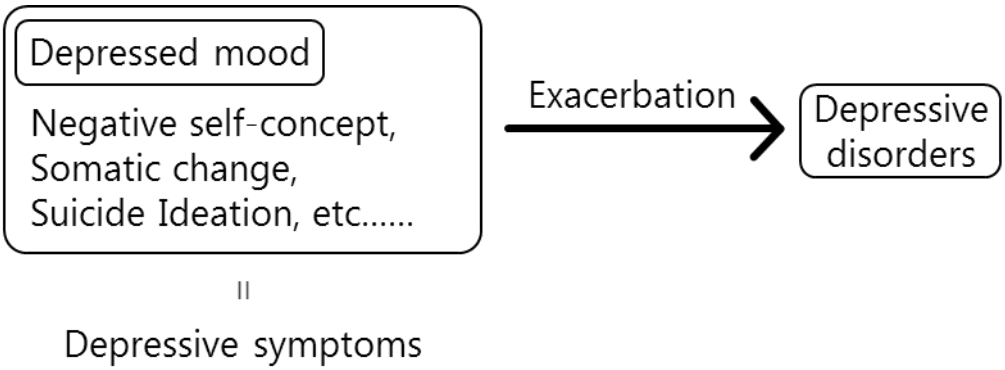


**Figure 1-1**. The terminology of depression. The term depression includes (a) depressed mood, (b) depressive symptoms, and (c) depression as a mental disorder or depressive disorders. The present thesis is based on the theory that posits a continuity between non-clinical and clinical levels of depressive symptoms (Cox et al., 2001; Ruscio & Ruscio, 2000).

symptoms can exacerbate their condition. Although there is controversy whether depressive symptoms are continuous or qualitatively different between clinical and non-clinical samples, researchers have provided evidence for a continuity of symptoms (Cox, Enns, Lasen, 2001; Ruscio & Ruscio, 2000). In addition, research performed with undergraduate students or children often use the term "depressive symptoms" for non-clinical or mild depressive symptoms-like experiences (e.g., Jones, Papadakis, Hogan, & Strauman, 2009; Verstraeten, Vasey, Raes, & Bijttebier, 2009). In the present thesis, non-clinical depressive experiences are also called depressive symptoms for convenience because this thesis was conducted completely with undergraduate or graduate students.

### 1.1.2. Need for effective therapy and prevention for depressive disorders

The social situation urges the development of effective therapy for depressive disorders. Depressive disorders are prevalent and the number of individuals suffering with these is increasing. Recent research has reported that the prevalence of MDD in adults increased from 13.8 million to 15.4 million between 2005 and 2010 in the USA (Greenberg, Fournier, Sisitsky, Pike, & Kessler, 2015). In addition, the cost of depression is enormous and increasing. Estimated economic burdens of depression, including treatment costs and related costs (e.g., productivity loss), amounted to £9 billion in 2000 in the UK (Thomas & Morris, 2003), and ¥2.0 trillion in 2005 in Japan (Sado, Yamauchi, Kawakami, Ono, Furukawa, et al., 2011). In the USA, between 2005 and 2010, the economic burden of individuals with MDD increased from $173.2 billion to $ 201.5 billion (Greenberg et al., 2015). Because of this enormous social loss, the effective and efficient treatments for depressive disorders are highly important.

Furthermore, researchers and caregivers have to keep in mind that depressive disorder can be a deadly disorder, same as some physical diseases such as cancer or heart disease. Conwell, Duberstein, Cox, Herrmann, Forbes, and Caine (1998) reported that 90.1% of suicide victims

suffered from a mental illness (e.g., MDD). They suggested that the suicide risk among depressed individuals increases with age. Other studies have indicated that the suicide risk, including suicide completion and suicide attempts, is higher in depressive patients than in the general population (e.g., Cavanagh, Carson, Sharpe, & Lawrie, 2003; Harris & Barraclough, 1998; Hawton & van Heeringen, 2009). Moreover, depressive disorders has a high recurrence rate (Mueller, et al., 1999). Meta-analytic research indicated that approximately 50% of depressed patients relapse within 2 years (Vittengl, Clark, Dunn, & Jarrett, 2007). For protection of both the depressed individuals and economic resources, the development of prevention methods is essential. From a prevention standpoint, studies on non-clinical or mild depressive symptoms are just as important as those on clinical depressive symptoms or depressive disorders because the attempt to elucidate the process in which non-clinical depressive symptoms exacerbate can largely contribute to the development of effective prevention methods.

Such studies with non-clinical participants but from clinical perspectives are called analogue studies or analogue research. In analogue studies, researchers recognize the severity of mental disorders as continuous variables, and treat non-clinical samples as analogues of clinical patients (Sugiura, 2009). Although some researchers argue that non-clinical or mild depression qualitatively differs from pathological depression, others have provided supportive evidence that non-clinical and clinical depressive symptoms form a continuum (Cox et al., 2001; Ruscio & Ruscio, 2000).

Analogue research is a widely accepted methodology that can easily control the conditions and deal with large sample sizes. It can contribute to the clarification of the mechanism for pathology initiation and the intervention mechanism that affects psychological maladjustment. Nevertheless, analogue research also has several limitations (Sugiura, 2009). For instance, findings of analogue studies are difficult to generalize to clinical patients. Ecological validity is also a

constraint. Researchers should examine whether experimental manipulations such as mood induction can successfully imitate actual mood state features in clinical patients, whether experimental situations can be applied to the symptoms occurring in daily life, and whether questionnaire assessments can capture analogues of the targeted clinical symptoms.

Despite these limitations, analogue research can be effective, especially when focusing on the prevention of psychological illness, since researchers can directly deal with target samples. Therefore, in this thesis, I focused on depressed mood and depressive symptoms in an analogue sample (i.e., healthy or non-clinically depressed) of graduate and undergraduate students, to investigate the mechanism that causes non-clinical depression to increase and decrease, and to propose prevention methods for depressive disorders.

## 1.2. Self-focused attention

### 1.2.1. The theory of self-focused attention and its association with depression

Beck's depression theory proposed "self" as one of the core factors of depression (Beck & Alford, 2009; Beck, Rush, Shaw, & Emery, 1979); therefore, self-referent cognitions are extensively investigated in studies of depression. In particular, *self-focused attention* has been recognized as an important cognitive risk factor for depressive disorders (for a review see, Mor & Winquist, 2002). A well-known definition of self-focused attention is that it is "an awareness of self-referent, internally generated information derived through sensory receptors" (Ingram, 1990, p156). In addition, researchers have treated self-focused attention as both state (i.e., self-focusing state) and trait (i.e., the tendency toward self-focusing) variables.

In objective self-awareness theory, Duval and Wickland (1972) initially theorized self-focused attention and its association with affective responses. According to this theory, the attention of a person always focuses on the self or the external environment. Once his/her consciousness

focuses on the self, a certain aspect of self becomes evident and self-evaluative processes start to assess the discrepancy between the self's current state and one's personal standards of correctness. When the evaluative process concludes that the current state exceeds the standard (i.e., a positive self-discrepancy exists), positive self-evaluation occurs which produces positive affect. On the other hand, when the current state falls below the standard (i.e., a negative self-discrepancy exists), negative self-evaluation occurs and negative feelings are produced, including a depressed mood. This negative evaluation subsequently induces the motivation to reduce the negative self-discrepancy.

Carver and Scheier (1982, 1990) advanced the model of Duval and Wickland (1972), and proposed control theory. In their theory, behaviors for reducing self-discrepancy (i.e., self-regulation or self-regulatory behaviors) form a feedback loop system (Figure 1-2). Similar to the objective self-awareness theory, self-focus compares the self-discrepancy between one's personal reference and current states. When the comparison indicates a negative self-discrepancy, individuals adjust their behavior to make their current self-state closer to their baseline reference. Self-focused attention then assesses the discrepancy again. The behavior terminates if current state meets the standard or the discrepancy is acceptable, while the behavior continues if there is still unacceptable negative discrepancy; the feedback loop continues until the discrepancy becomes acceptable. In addition, self-focused attention also monitors the progress rate toward reducing self-discrepancy. In control theory, perceived progress-rates affect emotional states. If the progress rate is faster than the reference, positive affect occur and the person renews the effort for self-regulation. However, if the progress rate is slower than the reference, the person feels negative affect and withdraws the attempt to reduce negative discrepancy. An additional feature of control theory is that the feedback loop has a hierarchical construction. At first, self-focus compares the current self with the abstract idealized self-image. If there is negative discrepancy, self-focus then compares the real self with the concrete

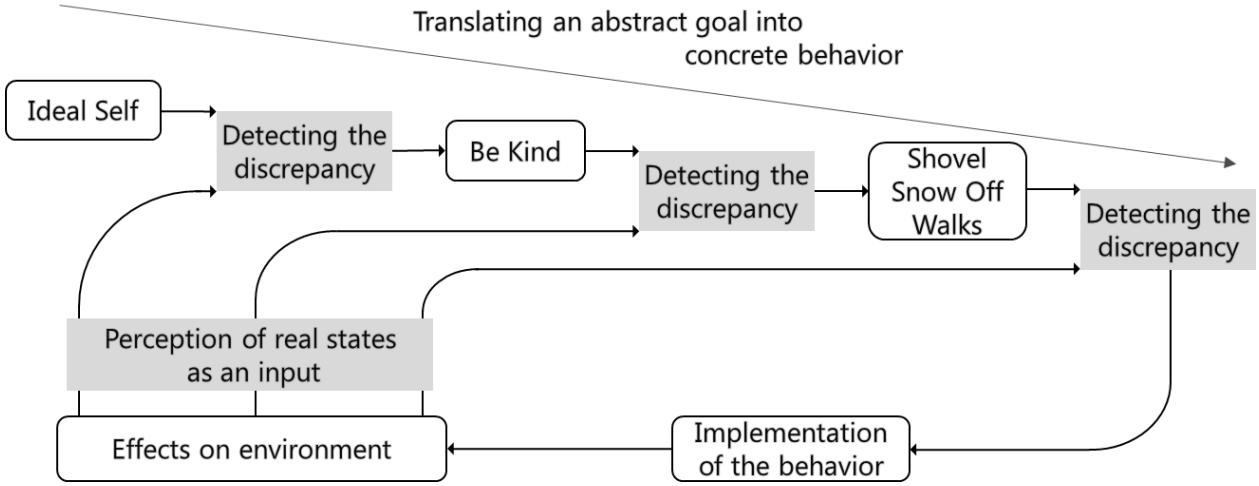


**Figure 1-2.** Control theory framework (Carver & Scheier, 1990). Self-focused attention compares ideal and real states and detects a negative self-discrepancy. Self-focus also monitors this feedback loop and its progress rate. Successful self-regulation requires proper translation of an abstract goal into concrete and attainable behavior (Watkins, 2008).

reference (e.g., be kind). When this level comparison indicates a negative discrepancy, a more concrete reference (e.g., shovel snow off walks) is compared with the current self (Carver & Scheier, 1990). For successful reduction of this discrepancy, individuals must properly translate the abstract goal into concrete and attainable behavior (Watkins, 2008).

An important issue to examine is how self-focus increases depression. As Carver and Scheier (1990) proposed, when individuals direct their attention to the self, they are aware of their reference of correctness and compare that concurrently with their current state. In many cases, the current state falls below the reference, resulting in negative affect. Therefore, individuals who often focus on themselves often feel depressed. In addition, Smith and Greenberg (1981) pointed out similarities between self-focus and depression, namely, reduced self-esteem, increased attribution to internal factors, increased expression of affect, and accurate self-reports. Based on these similarities, they argued that self-focused attention increases depressive symptoms. Additional findings supported this notion by assessing self-focus and depression using various measures (Mor & Winquist, 2002).

### 1.2.2. Paradoxical nature of self-focus: self-rumination and self-reflection

Despite these supporting findings and sound theoretical basis, self-focused attention has only a moderate association with depression (Mor & Winquist, 2002). Theorists have suggested that the reason for this moderate association is that self-focused attention has both adaptive and maladaptive aspects (Martin & Tesser, 1996; Trapnell & Campbell, 1999). For instance, in control theory, self-focus easily produce negative feelings but is necessary for the self-regulatory cycle because self-discrepancy cannot be recognized without self-focused attention, and the cycle cannot be initiated (Carver & Scheier, 1982, 1990). Martin and Tesser (1996) also argued that self-focused attention is a necessary step in self-regulation or problem solving. In addition, self-focused attention is

apparently required for accurate self-knowledge that is critical for psychological growth (Trapnell & Campbell, 1999). This “sadder but wiser” feature of individuals with the tendency towards self-focus is referred as the “self-absorption paradox” (Trapnell & Campbell, 1999).

To resolve this paradox and extract the negative aspect of self-focus, Trapnell and Campbell (1999) have proposed *self-rumination*, based on motivation and relationships with the Big Five personality factors in their lexical trait taxonomy. According to the definition by Trapnell and Campbell, self-rumination refers to neurotic self-focused attention that is motivated by loss, threat, and injustice to self. They considered that the tendency toward self-rumination exacerbates depressive symptoms by chronically and repeatedly focusing on negative self-referential information. Consistent with their theory, the positive association between self-rumination and depressive symptoms has been repeatedly replicated (e.g., Kuster, Orth, & Meier, 2012; Siegle, Moore, & Thase, 2004). Moreover, additional research has indicated that trait self-rumination amplifies stressors effects on depressive symptoms, suggesting that trait self-rumination leads to excessive self-focus after negative life events that results in excessive focus on negative self-referential information and subsequent exacerbation of depressive symptoms (Mori & Tanno, 2013; Takano, Sakamoto, & Tanno, 2011). Furthermore, experimental studies have reported that induced ruminative self-focus has exacerbated sad and depressed mood in dysphoric participants, whereas distraction from one’s self-focus resulted in a shortened depressed mood (Lyubomirsky, Tucker, Caldwell, & Burg, 1999; Nolen-Hoeksema & Morrow, 1993). Previous studies have also showed links between self-rumination and other unconstructive outcomes such as decreased subjective happiness (Elliott & Coker, 2008), low levels of perspective taking (Joireman, Parrot, & Hammersla, 2002), and impaired interpersonal skills (Takano et al., 2011). In this way, previous research on self-focus have mainly investigated maladaptive trait self-rumination and self-ruminative thinking.

Considering the accumulating evidence for the maladaptivity of ruminative self-focus, it is reasonable to assume we should not focus on ourselves to help prevent depression. However, as discussed above, self-focused attention has an adaptive aspect that contributes to self-regulatory cycle and self-knowledge. Trapnell and Campbell (1999) proposed adaptive self-focus, or *self-reflection*, as the opposite to self-rumination. Self-reflection is related with openness to experiences and motivated by curiosity or epistemic interest in self. This adaptive self-focus has a positive association with the need for self-knowledge and negative associations with depressive symptoms (Takano & Tanno, 2009b; Trapnell & Campbell, 1999). This discrimination between self-rumination and self-reflection can resolve the self-absorption paradox. Individuals with a tendency towards self-focus are not, "sadder *but* wiser" but rather, "sadder *or* wiser" (Trapnell & Campbell, 1999). However, although evidence for the maladaptivity of self-rumination is accumulating, research on self-reflection is sparse and there are many ambiguities about how and if self-reflection adaptively works. Indeed, the association between self-reflection and depression has been unstable in previous studies (e.g., Takano & Tanno, 2009b; Trapnell & Campbell, 1999; Siegle et al., 2004); therefore, I will discuss how self-reflection can adaptively function in the following section. Clarifying adaptive function and nature of self-focused attention could suggest the method for utilizing adaptive self-focus instead of maladaptive self-focus, which can contribute to developing effective interventions and preventions for depressive disorders.

It should be noted that the term "rumination" can be characterized as a stable, negative, and broadly construed way of responding to goal discrepancies (Smith & Alloy, 2009); however, theorists have proposed several definitions. I based my thesis on Trapnell and Campbell's (1999) theory that defines self-rumination as a negative type of self-focus motivated by loss, threat, or injustice to self. As another conceptualization of rumination, Nolen-Hoeksema, Wisco, & Lyubomirsky (2008) defined depressive rumination as passive and non-instrumental responses to

one's depressive symptoms or their cause and results. A more general form of rumination (Martin & Tesser, 1996) is conceptualized not as responses to depressive symptoms, but as instigated by goal discrepancies. Based on Martin and Tesser's theory, Watkins (2008) argued that such ruminative thinking might be maladaptive or adaptive depending on construal level; however, this conceptualization differs from Trapnell and Campbell (1999) in that they distinguished between maladaptive and adaptive self-focused attention. Although my review of literatures includes the research that measured depressive rumination, the evidence suggests a significant overlap between self-rumination and depressive rumination (Siegle et al., 2004; Schoofs, Hermans, & Raes, 2010).

### 1.3. Problem solving: a mediator between self-focus and depression

According to control theory, self-focus monitors the self-regulatory cycle (Carver & Scheier, 1982, 1990). This implies that self-focused attention can affect this cycle. For example, if self-focus assesses a perceived self-discrepancy greater than actual self-discrepancy, individuals may make more efforts to accelerate the progress rate than what is necessary, and waste resources required for subsequent steps in the self-regulatory cycle. Similarly, if self-focus assesses the progress rate as faster than expected against the genuine rate, individuals may make less efforts incorrectly that will delay the self-regulatory cycle. In other words, successful self-regulation requires accurate assessment of the negative self-discrepancy by self-focused attention. Recent theorists emphasize the importance of a proper monitoring function for self-regulation within the framework of control theory (Inzlicht, Legault, & Teper, 2014). Specifically, they proposed that effective self-regulation requires the ability to detect negative self-discrepancy accurately and to observe this discrepancy objectively. This raises the issue that if a certain self-focusing style can accurately monitor negative self-discrepancy without ruminating about the discrepancy, it might enhance self-regulation. Therefore, it is hypothesized that adaptive and maladaptive aspects of self-focus are distinguished

by how they affect self-regulatory behavior.

Self-regulation is conceptualized to be a process in which a person resolve negative self-discrepancy, and thus includes many different types of behaviors including internal conflict resolution and efforts to change the external undesirable environment. Self-regulation is often construed to involve self-control that is to control one's behavior by one's own will. However, because many researchers make no clear distinctions between these two concepts, I also do not differentiate them and hereafter use the term self-regulation as cognitive and behavioral process to reduce negative self-discrepancy. In this thesis, I focus on problem solving as one of the self-regulatory behaviors in order to contrast the adaptive function of self-focus on depression with the maladaptive one. Although problem solving has divergent definitions across research contexts (e.g., mathematical, mechanical, and personal), I hereafter refer to problem solving as a behavior aimed at solving a stressful problem or resolving a stressor. Similar conceptualization of problem solving can be seen in clinical psychology when addressing coping with stress and emotion regulation (e.g., Anderson, Goddard, & Powell, 2007; D'Zurilla & Nezu, 1990; Heppner & Peterson, 1982). Clinical researchers often measure problem solving as a set of abilities for solving problems (i.e., problem-solving ability) and the behavior typically comprises gathering information, generating solutions, and implementing solutions (i.e., problem-solving behavior). In the context of clinical psychology, problem solving is conceptualized as one of the adaptive emotion regulation strategies (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Although problem-solving behavior is not necessarily a specific and direct action aimed at reducing negative emotions, it may lead to beneficial emotional outcomes by modifying or eliminating stressors (Aldao et al., 2010; D'Zurilla & Sheedy, 1991); that is, problem solving may directly reduce negative self-discrepancy. Supporting the importance of problem solving in negative emotion regulation, studies have shown that impaired problem-solving ability is associated with emotional dysfunction and psychopathology, including depression (Aldao

et al., 2010; Anderson et al., 2007; Ciarroch & Scott, 2006; Nezu & Ronan, 1988).

Researchers have argued that impaired problem solving may play a key role in the association between self-rumination and depression, although the nature of self-rumination, being repeatedly facing with the negative aspects of one's self, per se exacerbates negative and depressed feelings. Indeed, ruminative self-focus has been found to be associated with low levels of goal success and delayed progress of self-regulation (Martin & Tesser, 1996; Moberly & Watkins, 2010), resulting in an increased negative affect (Carver & Scheier, 1990). This association has been demonstrated through experimental studies, suggesting that dysphoric individuals induced to engage in ruminative self-focus tend to generate less effective solutions to, and more negatively biased interpretations of, challenging situations. Consequently, this decreases the motivation to resolve the problems and reduces self-confidence in one's own ability through increased feelings of hopelessness (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999). A similar association between ruminative self-focus and impaired problem solving has been repeatedly reported in both clinical and non-clinical samples (Donaldson & Lam, 2004; Takano et al., 2011; Watkins & Baracaia, 2002; Watkins & Moulds, 2005). More recently, theorists have suggested that ruminative self-focus can be characterized by a reduced concreteness in thinking (Watkins & Moulds, 2007). This suggestion raises the possibility that self-ruminators cannot construe higher abstract-level references into lower concrete-level references in the self-regulatory cycle; therefore, becoming stuck in the abstract level of the cycle. This results in chronic repetitive thinking on one's negative aspects which is abstract and overgeneralized (Watkins, 2008). Taken together, self-rumination may impair monitoring function on self-regulatory cycle by chronically focusing on self-discrepancy or negative mood evoked by it (Trapnell & Campbell, 1999), overestimating the magnitude of the discrepancy (Lyubomirsky & Nolen-Hoeksema, 1995), and becoming stuck in the abstract level of the cycle (Watkins & Moulds, 2007). Impaired monitoring in turn may reduce

willingness for resolving self-discrepancy and increase difficulty in solution generation (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999), resulting in delayed self-regulatory cycle. In particular, if this delay occurs in problem solving, problems will neither be eliminated nor modified, and stress will continue to harm individuals, produce a depressed mood, and/or exacerbates depressive symptoms.

Contrary to self-rumination, there is the possibility that self-reflection plays an adaptive role in the self-regulatory cycle, since self-focus was originally considered to be a functional cognitive activity that is typically involved in the self-regulatory cycle, and may improve the extent and accuracy of self-knowledge (Martin & Tesser, 1996; Trapnell & Campbell, 1999; Watkins, 2008). In particular, it may be possible that self-reflection contributes to proper monitoring on negative self-discrepancy without ruminative thinking, resulting in enhanced problem solving. Providing illustrations of the adaptivity of self-reflection, previous studies have indicated that self-reflection tends to be associated with autonomous self-regulation (Thomsen, Tønnesvang, Schnieber, & Olesen, 2011), interpersonal skills (Takano et al., 2011), and positive reappraisal tendencies of individuals who have experienced failures, which allows them to generate alternative solutions (Jones et al., 2009). Furthermore, self-reflection is associated with self-knowledge clarity (Şimşek, Ceylandağ, & Akcan, 2013; Trapnell & Campbell, 1999); therefore, it may contribute to generating solutions that are both suitable for oneself and can be easily implemented. These findings suggest that self-reflection may play an adaptive role in facilitating the progress of problem solving that would consequently contribute to efficient emotion regulation after experiencing stressful and troublesome events. Hence, by setting problem-solving ability as a mediator, the negative association between self-reflection and depression will clearly appear; however, no previous research has investigated such associations.

### 1.4. Decentering: a possible source of adaptive nature of self-focused attention

Possible reasons for the lack of research and ambiguity of the adaptive function of self-reflection is that its contents, mode, and valence are not well defined. Because self-reflection is conceptualized based on motivation and its relationship with the Big Five factors (Trapnell & Campbell, 1999), the definition of self-reflection does not incorporate specific examples of self-reflective thinking. This may produce difficulty for the interpretation of results, experimental induction, extracting adaptive essence, and further detailed examination of self-reflection. In the preceding section, I discussed that problem solving is one of the outcomes of self-focused attention, and self-reflection and self-rumination both affect problem solving differently. Next, I will discuss the source of adaptivity of self-reflection. In the present thesis, I explored the nature of self-reflection in relation to *decentering* (Teasdale et al., 2002) to elucidate its adaptive nature. Decentering, which has emerged from mindfulness theory, is the ability to observe one's internal experiences objectively such as thoughts and feelings (Fresco, Moore et al., 2007; Teasdale et al., 2002).

The difference between the maladaptive and adaptive functions of self-rumination and self-reflection may derive from their differing relationships with decentering. Mindfulness-based depression interventions aim at acquiring the ability to direct and maintain attention towards the present moment in an open and non-judgmental way, and a number of empirical studies have reported that mindfulness-based intervention resulted in reduction of ruminative thinking (Campbell, Labelle, Bacon, Faris, & Carlson, 2012; Shapiro, Brown, & Biegel, 2007; Shapiro, Oman, Thoresen, Plante, & Flinders, 2008) and depressive symptoms (for a review, see Hofmann, Sawyer, Witt, & Oh, 2010). Mindfulness theory proposes that the effects of mindfulness-based cognitive behavior therapy for depression are due to increased decentering (Teasdale et al., 2002). The core concept of decentering, rather than changing the content of one's thoughts, is changing one's relationship to one's thoughts (Fresco, Moore et al., 2007; Teasdale et al., 2002). Theorists

have suggested that decentering counteracts ruminative thinking since decentered individuals are aware of their ruminative thinking; therefore, they can decrease their ruminative thoughts, and this subsequently leads to a reduction of depression (Fresco, Moore et al., 2007; Teasdale et al., 2002). Consistent with this theory, studies have found a negative association between decentering and rumination (Fresco, Moore et al., 2007; Kurihara, Hasegawa, & Nedate, 2010). In addition, recent research has reported that decentering is negatively associated with depressive symptoms (Fresco, Moore et al., 2007; McCracken, Barker, & Chilcot, 2014) and positively related to protection against relapse of MDD (Fresco, Segal, Buis, & Kennedy, 2007). Therefore, decentering is considered to reduce depressive symptoms indirectly by decreasing ruminative thinking. The previous findings and theory mentioned above indicate that decentering counteracts ruminative self-focus; however, it also raises the issue of how trait self-rumination increases depressive symptoms. That is, individuals with a tendency towards self-rumination conceptually have difficulty taking a decentered perspective spontaneously, and are consequently unable to avoid depressive feelings (Fresco, Moore et al., 2007; Teasdale et al., 2002). Furthermore, previous research has indicated that some ruminative people are motivated for rumination by the belief that ruminative thinking is helpful for problem solving, and they often voluntarily engage in maladaptive self-rumination (Papagerogiou & Wells, 2001; Takano & Tanno, 2010). Although these imply that trait self-rumination decreases decentering[1] and indirectly increases depressive symptoms, such causality has been rarely examined in the context of psychological treatment, which emphasizes reduction of maladaptive factors.

[1] Theorists have proposed decentering as the ability or skill that is acquired by mindfulness-based cognitive behavioral therapy. However, questionnaire scores of decentering have certain distribution in non-clinical population (e.g., Fresco, Moore et al., 2007). In addition, some previous studies have been conducted with an assumption that decentering could change without mindfulness training (e.g., Tanaka, Kamimura, & Sugiura, 2013). The present thesis also focused on the change of decentering that is naturally occurs in non-clinical population and examined the effects of personalities (e.g., self-rumination and self-reflection) on the change.

In contrast to self-rumination, self-reflection is considered associated with increased decentering. Following Trapnell and Campbell (1999), the thought contents of self-reflective people can conceptually be both positive and negative (e.g., I love analyzing why I do things) and are not always emotionally loaded (e.g., I'm very self-inquisitive by nature). This suggests that individuals high in self-reflection may encounter negative thoughts or emotions just as individuals low in self-reflection do. Nevertheless, prior researchers have reported the negative association between self-reflection and depressive symptoms (Takanno & Tanno, 2009b). Integrating the above findings yields a hypothesis that individuals high in self-reflection can objectively focus on their inner experiences, even if those experiences are negatively loaded. Thus, in contrast to self-rumination, self-reflection may be positively associated with decentering. In fact, one previous study reported a positive correlation between self-reflection and decentering (Lau et al., 2006). Decentering can mediate the relationship between self-reflection and its benefits such as clear self-knowledge (Şimşek et al., 2013) and decreased depressive symptoms (Takano & Tanno, 2009b). If individuals high in self-reflection have a higher decentered perspective, they can observe themselves objectively and clarify their self-knowledge without negative bias (Şimşek et al., 2013) and feel less depressed (Takano & Tanno, 2009b). Therefore, adaptive functions of self-reflection are hypothesized because of its decentered perspective on negative self-discrepancy.

Furthermore, Inzlicht et al. (2014) proposed that successful self-regulation requires not only an accurate detection of and proper reaction to negative self-discrepancy, but also acceptance of, or a decentered-way of viewing the discrepancy. It may seem illogical that accepting or decentering from a negative self-discrepancy is necessary for self-regulation because self-regulatory process is initiated by the judgment that the discrepancy is unacceptable, and should be resolved. However, temporarily accepting and not judging the negative self-discrepancy can enable individuals to subsequently maintain their attention on the discrepancy and further monitor it (Inzlicht et al., 2014;

Teper, Segal, & Inzlicht, 2013). If individuals would completely reject the discrepancy, they might fall into negative rumination or continuing on distraction to avoid the negative emotions that arise from the discrepancy (Pyszczynski & Greenberg, 1987). This disturbs proper monitoring; therefore, a prior finding that self-reflection was related to autonomous self-regulation (Thomsen et al., 2011) may be also due to a decentered perspective of the self-reflector. However, the study by Thomsen et al. (2011) was cross-sectional and mainly focused on the motivational aspect of self-regulation and not on its effectiveness. At this point, it is unclear whether self-reflection contributes to problem solving or self-regulation. Therefore, I will examine the association between self-reflection and problem solving that contributes to the reduction of depressive symptoms. Based on the results of that research, I will next test the association between self-reflection and decentering and discuss about the adaptive nature of self-focus.

### 1.5. Aims and overview

The aims of the present thesis were to elucidate how self-focused attention adaptively works in relation to depressive symptoms and to suggest a practical implication for effective and efficient method to prevent depressive disorders. For these aims, I focused on problem solving that can be a mediator between self-focused attention and depression, and decentering which can explain the nature of self-reflection (Figure 1-3). This thesis has two specific aims. The first aim is to clarify adaptive function of self-focused attention by testing that self-focus can contribute to problem solving and the reduction of depression. Chapter 2 investigated the associations between self-focus, problem solving, and depressive symptoms. In Study 1, I investigated those associations using a cross-sectional survey to measure general problem-solving confidence as a mirror of actual problem-solving ability. I reported that problem-solving confidence was positively associated with self-reflection and negatively associated with self-rumination. In addition, problem-solving

confidence had a negative association with depressive symptoms. In Study 2, I employed a diary method to examine the associations between self-focus, actual problem-solving behavior, and depressed mood in daily living. Results indicated that self-reflection was related to the enhanced mood-regulation function of problem-solving behavior, whereas self-rumination modestly amplified the positive association between stress intensity of problem and depressed mood, suggesting that self-reflection enhances daily problem solving. In Study 3, to test that self-reflection can contribute to actual problem solving and its performance; I created an academic problem-solving task that can quantitatively and objectively assess the amount of problem-solving behavior and problem-solving performance. Results showed that high self-reflectors exhibit more problem-solving behaviors and higher score of the task than low self-reflectors do. Self-reflectors also exhibited effective pattern of problem-solving behaviors.

The second aim was to explore the nature of self-reflection contrasted with self-rumination. The results of Chapter 2 suggested that self-reflection enhances problem solving that requires accurate detection and decentered observation of negative self-discrepancy. In Chapter 3, I examined the associations between self-reflection and decentering. In Study 4, I investigated a mediation model in which self-reflection and self-rumination are indirectly associated with depressive symptoms, and these associations are mediated by decentering. As a result, self-reflection had an indirect negative association with depressive symptoms through higher decentering, while self-rumination had both direct and indirect associations with depressive symptoms. Since Study 4 employed a cross-sectional design, it cannot conclude a temporal relationship. Therefore, Study 5 investigated the stress-diathesis model in which self-focus interacts with a stressor predicting the temporal change of decentering. While both self-reflection and self-rumination did not interact with stressors, results showed significant interaction between self-reflection and self-rumination, indicating that self-reflection contributed to the maintenance of

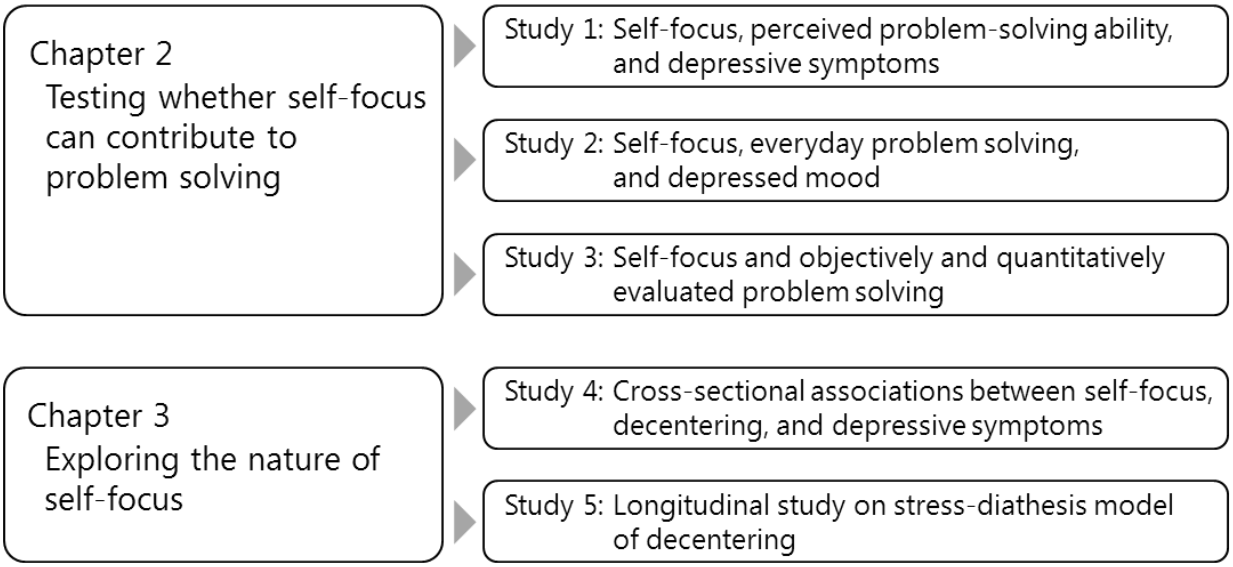


**Figure 1-3.** Overview of the present thesis.

decentering against high self-rumination. This partially supports the notion that a self-reflector can monitoring negative self-discrepancy with a decentered perspective against negative impacts from the discrepancy. In Chapter 5, I integrated these findings and discussed the adaptivity of self-focused attention, theoretical and practical implications, and future research directions.

# Chapter 2: The associations between reflective and ruminative self-focus and problem solving

## 2.1. Study 1: Self-focus, perceived problem-solving ability, and depressive symptoms

Chapter 2 examines whether self-focus can contribute to problem solving. In study 1, I tested the relationships between dispositional self-focused attention (i.e., self-reflection and self-rumination), perceived problem-solving ability, and depressive symptoms. Although there is no research on the direct association between self-reflection and problem solving, some studies have provided supporting evidence of this association. They revealed a negative association between self-reflection and depressive symptoms and a stress buffering effect of self-reflection (Takano & Tanno, 2009a; Mori & Tanno, 2013). They have suggested that such adaptivities of self-reflection are due to that it enhances problem solving, which can directly reduce stressors, consequently reducing depressive symptoms. Another study has also provided supportive findings that self-reflection was associated with social skills, which is a problem-solving ability relating to interpersonal problems (Takano et al., 2011). If self-reflectors have high problem-solving ability, they also exhibit high perceived problem-solving ability. Certainly, some people may have high confidence with no grounds. Self-reflective individuals, however, have accurate self-knowledge (Şimşek et al., 2013), which accurately links actual ability to confidence. Therefore, if self-reflection enhances problem solving, it also heightens perceived problem-solving ability by accurate self-evaluation of one's ability; that is, self-reflectors consider themselves capable individuals. In addition, if self-reflectors are confident in problem solving, they do not avoid problems but actively try to solve the problem. In this way, problem-solving confidence and active problem-solving style can mirror actual problem-solving ability.

On the other hand, some researchers treat confidence and style itself as a component of

problem-solving ability (D'Zurilla & Goldfried, 1971; D'Zurilla & Nezu, 1990; Heppner & Peterson, 1987). They posit that confidence and problem-solving style constitute cognitive aspects of problem-solving abilities and those cognitive aspects potentially determine how individuals respond to problematic situations. Therefore, cognitive aspects of problem-solving ability can affect all stages of problem-solving processes including specific behavioral problem-solving skills, namely, problem definition, solution generation, decision-making, solution implementation, and evaluation. Furthermore, researchers consider that cognitive aspects per se have effects on psychological adjustment (for a review, see Nezu, 2004). In particular, previous researchers reported that uncertain and avoidant orientations toward problems positively predicts depressive symptoms (Haugh, 2006) after controlling for self-reported specific problem-solving skills such as solution generation and implementation (Elliott, Shewchuk, & Richards, 2001) or controlling for observer-rated effectiveness of actual problem-solving attempts (Anderson, Goddard, & Powell, 2009). Therefore, high problem-solving confidence and active problem-solving style are considered to lead to depression reduction, yielding my further hypothesis that self-reflection indirectly relates to less depressive symptoms through high problem-solving confidence and active style.

In contrast, self-ruminators are hypothesized to recognize themselves to be poor problem solvers, because previous research reported the association between self-rumination or ruminative thinking and deficits in problem solving (e.g. Lyubomirsky & Nolen-Hoeksema, 1995; Takano et al., 2011; Watkins & Baracaia, 2002) and decreased confidence for problem-solving (Lyubomirsky et al., 1999). Moreover, self-ruminators are considered to have negative bias or a pessimistic perspective on self (Lyubomirsky et al., 1999). This leads self-ruminators to poorer perceived problem-solving abilities than their actual ones. These negative biases on one's ability and problematic situations possibly reduce motives for problem solving (Lyubomirsky et al., 1999). Self-ruminators are hypothesized to have poor confidence in problem solving and avoidant

problem-solving style, resulting in exacerbated depressive symptoms.

Thus, my first hypothesis states that self-reflection indirectly relates to lower depressive symptoms through high problem-solving confidence and active problem-solving style. Second, self-rumination is hypothesized to have indirect associations with higher depressive symptoms through low problem-solving confidence and avoidant style.

## Method

### Participants and Procedure

I conducted a cross-sectional questionnaire study with Japanese undergraduate students. Prior to data collection, students were informed that participation was voluntary, their answers were confidential, and there would be no connection to their school records. I collected data from participants who signed informed consent forms. A total of 397 participants completed questionnaire packets (313 men, 84 women) with a mean age of 19.2 years (*SD* = 1.2). Gender was coded as a binary variable (0 = *male* and 1 = *female*).

### Measures

**Self-rumination and self-reflection.** Tendencies towards self-rumination and self-reflection were assessed using the Rumination–Reflection Questionnaire (RRQ; Trapnell & Campbell, 1999). The RRQ consists of two subscales focusing on self-rumination (e.g., “I spend a great deal of time thinking back over my embarrassing or disappointing moments”) and self-reflection (e.g., “I love exploring my ‘inner’ self”). Each of the two subscales contains 12 items that were rated on a five-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). In this study, the Japanese version of the scale (Takano & Tanno, 2008) was used; this version exhibited good internal consistency ($\alpha = .87$ for self-rumination; $\alpha = .86$ for self-reflection).

**Problem-solving confidence and style.** Perceived problem-solving ability was assessed

using the Problem-Solving Inventory (PSI; Heppner & Peterson, 1982). The PSI consists of three filler items and three subscales measuring problem-solving confidence (PSC; e.g., "I have the ability to solve most problems even though initially no solution is immediately apparent"), approach-avoidance style (AAS; e.g., "When confronted with a problem, I stop and think about it before deciding on a next step"), and personal control (e.g., "Sometimes I get so charged up emotionally that I am unable to consider many ways of dealing with my problems [reverse-scored item]"). Originally, each item are rated on a six-point scale ranging from 1 (*strongly agree*) to 6 (*strongly disagree*). In the present study, to match other questionnaires' answer formats, I modified the anchors to range from 1 (*strongly disagree*) to 6 (*strongly agree*). Thus, high PSI scores mean the individual is confident, has a problem-approaching style, and controllability in emotion or behavior in problem solving. I used Japanese-translated items in the appendix from D'Zurilla's (1986) translated book edited by Maruyama (1995). Sugiura (1999) has noted some of these Japanese-translated items are difficult to understand and modified such items to be clearly figured out. Furthermore, Sugiura omitted the personal control subscale for its particularly ambiguous item contents. In the present study, I made no change in item content but conducted a confirmatory factor analysis to confirm whether original PSI structures (Heppner & Peterson, 1982) can be applied to the Japanese-translated version (Maruyama, 1995). As a result, several reverse-scored items in the Japanese version appeared to be normal items; the model was better fitted to data when the personal control factor was omitted[2], consisting with Sugiura (1999). Therefore, the PSI in this study contains the PSC subscale consisting of 11 items (two were reverse-scored items) with an alpha coefficient of .85 and the AAS subscale consisting of 16 items (eight items were reversed) with an

[2] A model with two factors (i.e., PSC and AAS) had better fit ($\chi^2$ (323) = 1185.04, $p < .001$, AGFI = .78, CFI = .75, RMSEA = .08) than one with three factors (i.e., PSC, AAS, and personal control; $\chi^2$ (461) = 1816.70, $p < .001$, AGFI = .73, CFI = .68, RMSEA = .09).

alpha coefficient of .84[3].

**Depressive symptoms.** To assess depressive symptoms, I administered the Beck Depression Inventory-second edition (BDI-II; Beck et al., 1996). This scale contains 21 items measuring depressive symptoms such as sadness, self-dislike, fatigue, and change in weight in the most recent two weeks. Each item was rated on a four-point scale (from 0 to 3). In the present study, the Japanese version of the scale (Kojima et al., 2002) was used with an alpha coefficient of .91.

**Statistical Analysis**

I used mediation analysis (Barron and Kenny, 1986) in order to examine the associations in which independent variables indirectly relate to dependent variables through mediators. Analyses were conducted using the Statistical Package for Social Sciences (SPSS, version 22.0) and SPSS macro (MEDIATE; Hayes & Preacher, 2014).

Mediation analysis basically includes three multiple regression analyses and tests of indirect effects (Figure 2-1). First, independent variable $X$ predicts dependent variable $Y$, yielding estimations of the $c$ path (total effect). Second, $X$ predicts the mediator variable $M$, yielding estimations of the $a$ path. Third, $X$ and $M$ predict $Y$, estimating the $b$ and the $c'$ paths (direct effects). If there are multiple mediators, a second regression analysis is repeated by the number of mediators. The indirect effect is defined as the product of coefficients $a$ and $b$. This indirect effect $a \times b$ matches the difference value between $c$ and $c'$. If the product $a \times b$ is not zero, there is an indirect association between independent and dependent variables through mediators. To test the indirect effect, the Sobel test (i.e., $Z$ test of the indirect effect) has traditionally been utilized. However, recent statisticians recommend using bootstrap estimation of confidence intervals of the indirect effect rather than the traditional Sobel test because the bootstrapping method requires no

[3] The personal control subscale had low internal consistency (α = .61), consistent with Sugiura's (1999) suggestion and the results of my confirmatory factor analyses.

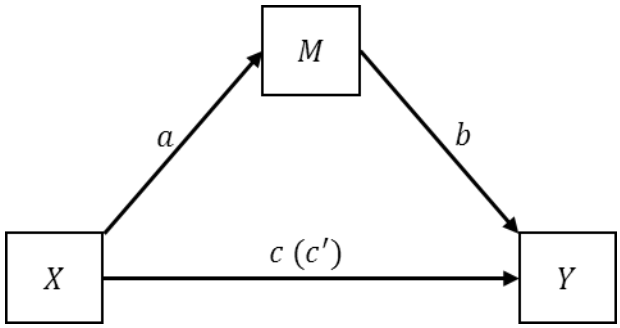


**Figure 2-1.** Conceptual presentation of simple mediation model.

assumptions of distributions of the product terms while traditional tests rely on impractical assumptions such as the normal distribution of the product $a \times b$ (Hayes, 2013; Preacher & Hayes, 2008). In addition, statistics development allows researchers to include multiple independent variables (and covariates), multiple mediators, and/or multiple dependent variables in mediation models (Hayes, 2013; Hayes & Preacher, 2014). In Study 1, I tested the multiple mediation or multiple mediators model (Hayes & Preacher, 2014), in which self-reflection and self-rumination predict depressive symptoms and these relationships are mediated by problem-solving confidence and style (Figure 2-2). Gender was also included in the model as a covariate because depressive symptoms are often higher in women than in men (e.g., Nolen-Hoeksema & Girgus, 1994).

## Results

Table 2-1 provides descriptive statistics and correlations between the study variables. Consistent with previous research (e.g., Trapnell & Campbell, 1999), my data indicated a significant correlation between self-rumination and depressive symptoms ($r$ =.45, $p < .001$) but not for self-reflection and depressive symptoms ($r$ = .03, $p$ = .610). Supporting my hypothesis, problem-solving confidence had distinct associations with self-reflection ($r$ = .27, $p < .001$) and self-rumination ($r$ = −.30, $p < .001$). Approach-avoidance style had significant associations with self-reflection ($r$ = .35, $p < .001$) but no relationship with self-rumination ($r$ = .02, $p$ = .674). Problem-solving confidence had a negative association with depressive symptoms ($r$ = −.33, $p < .001$) although the approach-avoidance style had significant but extremely small correlations with depression ($r$ = −.10, $p$ = .043).

### Multiple Mediation analysis

Next, I conducted the multiple mediation analysis (Figure 2-3; Table 2-2). First, ordinary least-squared multiple regression showed significant total effects of self-reflection ($c_1$; $B$ = −0.12, $SE$ =

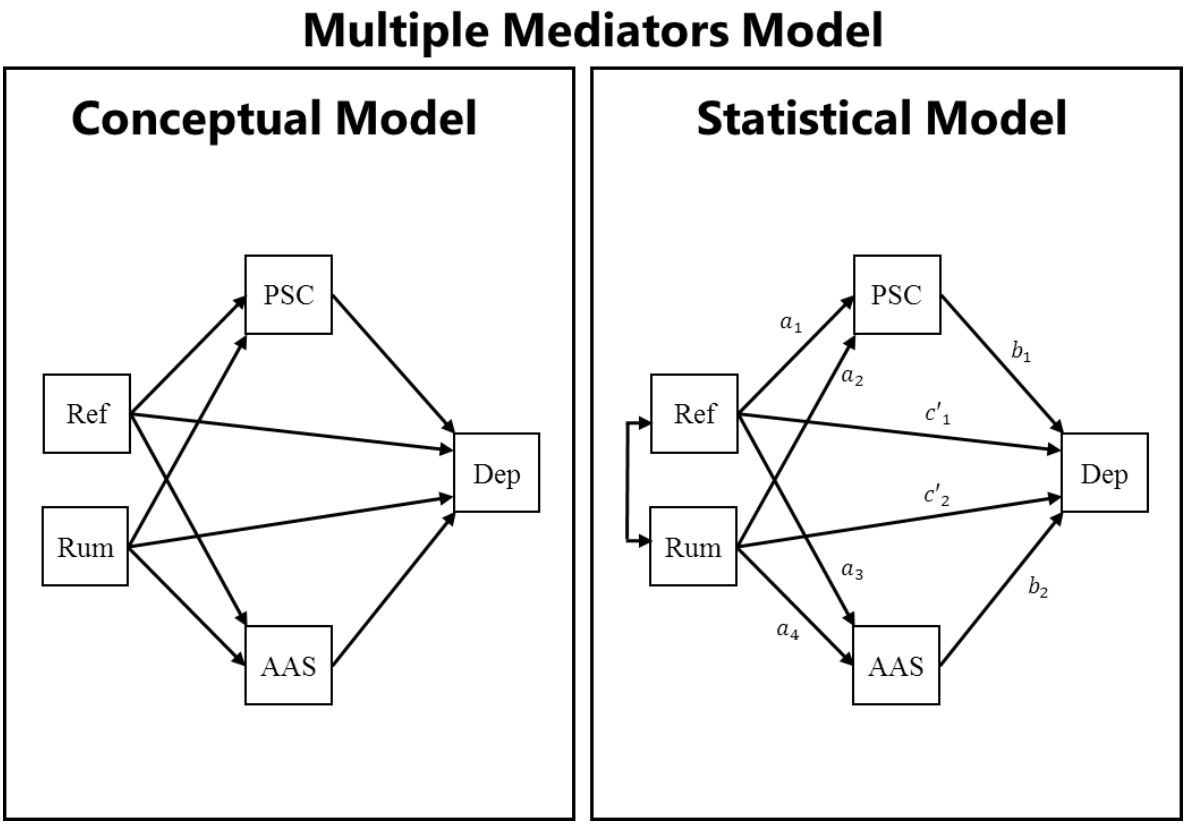


**Figure 2-2.** Conceptual and statistical presentations of multiple mediators model. Ref = Self-reflection; Rum = Self-rumination; PSC = Problem-solving confidence; AAS = Approach-avoidance style; Dep = Depressive symptoms.

**Table 2-1**

*Descriptive statistics and correlations*

| | Variables | *M* | *SD* | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|
| 1. | Depressive symptoms | 10.5 | 8.5 | — | | | |
| 2. | Self-reflection | 37.5 | 8.0 | .03 | — | | |
| 3. | Self-rumination | 39.7 | 8.5 | .45*** | .28*** | — | |
| 4. | PSC | 38.2 | 7.7 | -.33*** | .27*** | -.30*** | — |
| 5. | AAS | 57.8 | 9.2 | -.10* | .35*** | .02 | .48*** |

*Note*. PSC = Problem-solving confidence, AAS = Approach-avoidance style

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

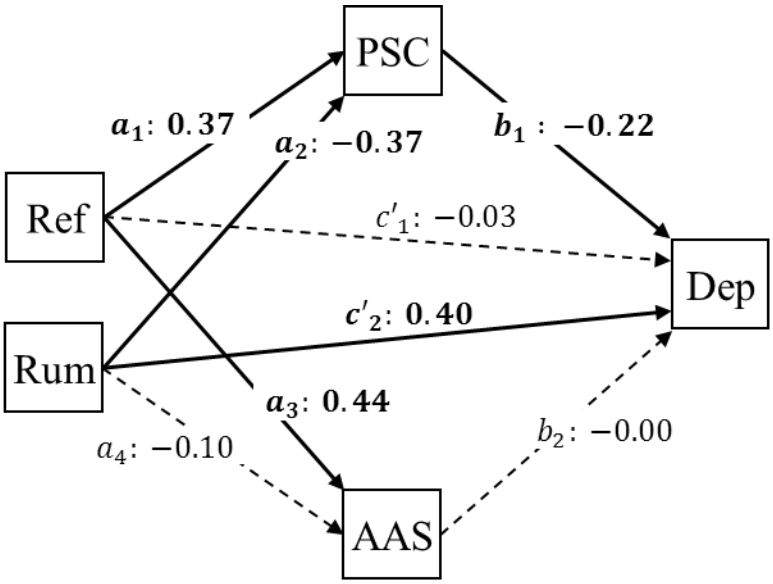


**Figure 2-3.** Result of multiple mediation analysis. Ref = Self-reflection; Rum = Self-rumination; PSC = Problem-solving confidence; AAS = Approach-avoidance style; Dep = Depressive symptoms. Unstandardized coefficients (*B*) are presented. Solid lines are significant paths ($p < .05$) and broken lines are non-significant or marginally significant paths ($p > .05$). For ease of presentation, covariate (i.e., gender) is not shown.

**Table 2-2**

*Multiple regression analyses of multiple mediators model*

| | Estimation of *c* paths, predicting Dep | | | Estimation of *a* paths, predicting PSC | | | Estimation of *a* paths, predicting AAS | | | Estimation of *b* and *c′* paths, predicting Dep | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *B* | (*SE*) | *t* | *B* | (*SE*) | *t* | *B* | (*SE*) | *t* | *B* | (*SE*) | *t* |
| Predictors | | | | | | | | | | | | |
| Gender | 1.29 | (0.93) | 1.39 | 0.59 | (0.84) | 0.70 | 0.55 | (1.07) | 0.52 | 1.42 | (0.92) | 1.55 |
| Self-reflection | -0.12 | (0.05) | -2.37 * | 0.37 | (0.04) | 8.30 *** | 0.44 | (0.06) | 7.69 *** | -0.03 | (0.05) | -0.64 |
| Self-rumination | 0.48 | (0.05) | 10.18 *** | -0.37 | (0.04) | -8.72 *** | -0.10 | 0.05 | -1.80 † | 0.40 | (0.05) | 7.82 *** |
| PSC | | — | | | — | | | — | | -0.22 | (0.06) | -3.62 *** |
| AAS | | — | | | — | | | — | | -0.00 | (0.05) | -0.06 |
| adjusted $R^2$ | .22 *** | | | .22 *** | | | .12 *** | | | .24 *** | | |

*Note*. Dep = Depressive symptoms, PSC = Problem-solving confidence, AAS = Approaching-avoidance style.

†$p < .10$, *$p < .05$, ***$p < .001$

0.05, $p$ = .018) and self-rumination ($c_2$; $B$ = 0.48, $SE$ = 0.05, $p$ < .001) on depressive symptoms. Relating to problem-solving confidence, $a_1$ (i.e., self-reflection to confidence; $B$ = 0.37, $SE$ = 0.04, $p$ < .001), $a_2$ (i.e., self-rumination to confidence; $B$ = −0.37, $SE$ = 0.04, $p$ < .001), and $b_1$ paths (i.e., confidence to depressive symptoms; $B$ = −0.22, $SE$ = 0.06, $p$ < .001) were also significant. On the other hand, although self-reflection positively predicted approach-avoidance style while self-rumination marginally and negatively predicted the style, active style had no association with depressive symptoms ($b_2$: $B$ = −0.00, $SE$ = 0.05, $p$ = .949). Then, with active problem-solving style as a mediator, bias-corrected bootstrapping showed no significant indirect effects of self-reflection (point estimate = −0.00, 95% CI [−0.05, 0.04]) and self-rumination (point estimate = 0.00, 95% CI [−0.01, 0.02]). Setting problem-solving confidence as a mediator, bias-corrected bootstrapping provided significant indirect effects of self-reflection (point estimate = −0.08, 95% CI [−0.14, −0.03]) and self-rumination (point estimate = 0.08, 95% CI [0.04, 0.15]).

However, test of regression homogeneity reached significance ($p$ < .001) with problem-solving confidence, which indicated that any of the independent variables interacted with the mediator and thus the indirect effects cannot be interpreted (Hayes & Preacher, 2014). Thus, I included the interaction term into subsequent analyses of the mediation model. To clarify which independent variable moderates the effect of problem-solving confidence, I conducted the ordinary multiple regression in which self-reflection, self-rumination, problem-solving confidence, and two-way interactions (i.e., self-reflection × confidence and self-rumination × confidence) predicted depressive symptoms. As a result, only self-rumination significantly interacted with problem-solving confidence ($p$ < .001). Then, I examined the model in which self-rumination moderates the indirect effect of self-reflection on depressive symptoms through problem-solving confidence[4].

[4] I did not include the approach-avoidance style in the model hereafter because it had no association with depressive symptoms.

Such model can be estimated in the framework of moderated mediation analysis using the SPSS macro PROCESS (Hayes, 2013). Moderated mediation includes various relationships in which any or all mediation model paths are moderated by one or more moderators (Hayes, 2013; Preacher, Rucker, & Hayes, 2007). These moderated mediation effects were denominated *conditional indirect effects;* Preacher et al. (2007) defined them as "the magnitude of an indirect effect at a particular value of a moderator (or at particular values of more than one moderator)."

**Moderated mediation analysis**

I conducted the moderated mediation analysis treating self-rumination as a moderator. Considering the possibility that self-rumination also interacts with self-reflection, I modeled a moderated mediation model in which self-rumination moderates all paths (Figure 2-4). This conceptual model is statistically expressed as a path diagram in Figure 2-4. Just as simple mediation analysis, moderated mediation includes multiple regression analyses for estimation of path coefficients and the bootstrapping method to test the conditional indirect effects. In this model, the mediator (i.e., problem-solving confidence) and dependent variable (depressive symptoms) were modeled as the following equations:

$$PSC = a_0 + a_1 Ref + a_2 Rum + a_3 (Ref \times Rum) + a_4 Gen + r$$

$$= a_0 + (a_1 + a_3 Rum) Ref + a_2 Rum + a_4 Gen + r$$

$$Dep = b_0 + b_1 PSC + b_2 (PSC \times Rum) + {c'}_1 Ref + {c'}_2 Rum + {c'}_3 (Ref \times Rum) + {c'}_4 Gen + r$$

$$= b_0 + (b_1 + b_2 Rum) PSC + ({c'}_1 + {c'}_3 Rum) Ref + {c'}_2 Rum + {c'}_4 Gen + r$$

where $PSC$ was problem-solving confidence and $Dep$ was the depressive symptoms score. Self-reflection and self-rumination were denoted as $Ref$ and $Rum$ respectively. Gender ($Gen$; 0 = men, and 1 = women) was also included as a covariate. The residuals were denoted by $r$. Therefore, the conditional indirect effect was defined as following,

$$(a_1 + a_3 Rum)(b_1 + b_2 Rum)$$

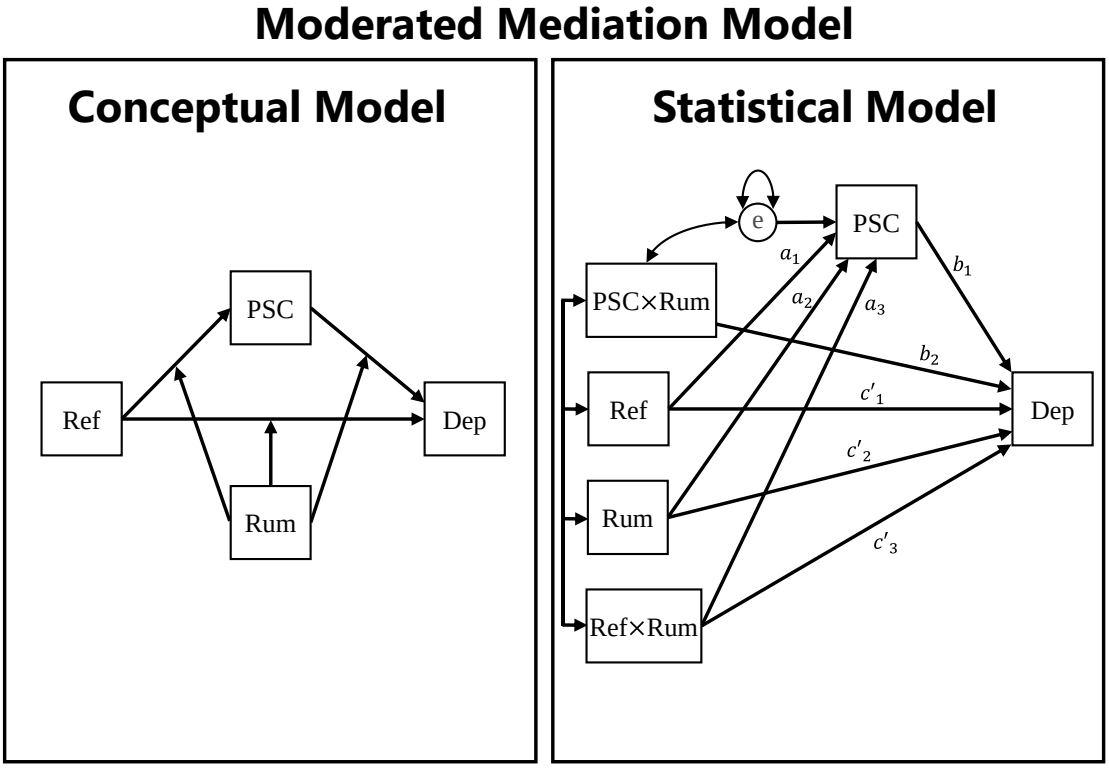


**Figure 2-4.** Conceptual and statistical presentations of moderated mediation model. Ref = Self-reflection; Rum = Self-rumination; PSC = Problem-solving confidence; Dep = Depressive symptoms.

which indicated that the magnitude of the indirect effect of self-reflection on depressive symptoms was dependent on self-rumination. The latter equation also provides a conditional direct effect ($c'_1 + c'_3 Rum$), which indicated that the magnitude of the direct effect of self-reflection varied across values of self-rumination.

As a result of the analyses, main effects of independent variables had magnitudes and signs similar to the result of simple mediation analysis (Figure 2-5; Table 2-3). Adjusted $R^2$s were adequately large and significant in all regression analyses (adjusted $R^2$s > .21, *ps* < .001). In regard to interaction terms, self-rumination moderated only the $b$ path, that is, coefficient $b_2$ ($B$ = −0.195, $SE$ = 0.005, $p$ < .001) was significant while $a_3$ ($B$ = −0.003, $SE$ = 0.004, $p$ = .495) and $c'_3$ ($B$ = 0.002, $SE$ = 0.005, $p$ = .682) were non-significant. This result indicated that the magnitude of the indirect effect of self-reflection was not a quadratic function of self-rumination but a linear one. To probe this indirect effect, I estimated the conditional indirect effects for higher and lower self-rumination ($M \pm 1$ *SD*) using bias-corrected bootstrapping method (resamples = 10,000) following Hayes (2013). For lower self-rumination, the conditional indirect effect was non-significant (point estimation = −0.02, 95% CI [−0.07, 0.03]) although significant for higher self-rumination at risk level .05 (point estimation = −0.13, 95% CI [−0.24, −0.06]).

Furthermore, I estimated the regions of significance for the conditional indirect effect to identify the ranges of self-rumination for which an indirect effect is statistically significant (Preacher et al., 2007). The bootstrapping method indicated that when self-rumination score was higher than 34.2 (M −0.66 *SD*) or lower than 66.7 (M + 3.19 *SD*), the conditional indirect effect were significant at risk level .05. Because the possible scores of self-rumination were from 12 to 60, the upper limit of the significance region was 60 and the lower limit was 34.2. These results suggest that self-reflection has a negative indirect association with depressive symptoms via problem-solving confidence; this indirect association strengthens when self-rumination is high although it

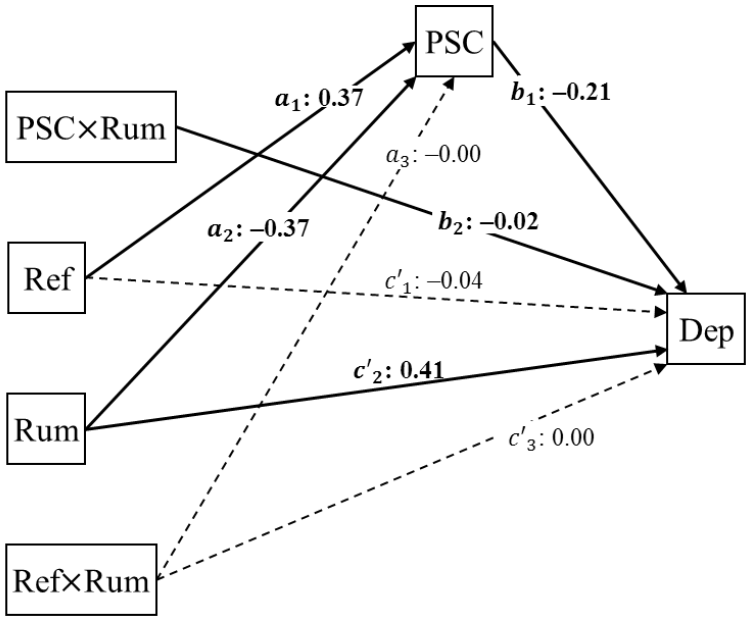


**Figure 2-5.** Result of moderated mediation analysis. Ref = Self-reflection; Rum = Self-rumination; PSC = Problem-solving confidence; Dep = Depressive symptoms. Unstandardized coefficients (*B*) are presented. Solid lines are significant paths ($p < .05$) and broken lines are non-significant paths ($p > .05$). For ease of presentation, covariate (i.e., gender) is not shown.

**Table 2-3**

*Multiple regression analyses analyses of moderatede mediation model*

| | Estimation of *c* paths, predicting Dep | | | Estimation of *a* paths, predicting PSC | | | Estimation of *b* and *c'* paths, predicting Dep | | |
|---|---|---|---|---|---|---|---|---|---|
| | *B* | (*SE*) | *t* | *B* | (*SE*) | *t* | *B* | (*SE*) | *t* |
| Predictors | | | | | | | | | |
| Gender | 1.30 | (0.93) | 1.39 | 0.59 | (0.84) | 0.70 | 1.46 | (0.90) | 1.62 |
| Self-reflection | -0.12 | (0.05) | -2.34 * | 0.37 | (0.04) | 8.30 *** | -0.04 | (0.05) | -0.79 |
| Self-rumination | 0.48 | (0.05) | 10.12 *** | -0.37 | (0.04) | -8.74 *** | 0.41 | (0.05) | 8.23 *** |
| Self-refection × Self-rumination | -0.00 | (0.01) | -0.51 | -0.00 | (0.00) | -0.68 | 0.00 | (0.00) | 0.41 |
| PSC | | — | | | — | | -0.21 | (0.05) | -3.99 *** |
| PSC × Self-rumination | | — | | | — | | -0.02 | (0.00) | -3.98 *** |
| adjusted $R^2$ | .21 *** | | | .22 *** | | | .27 *** | | |

*Note*. Dep = Depressive symptoms, PSC = Problem-solving confidence.

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

disappears when self-rumination is low. This suggestion is inconsistent with previous findings that self-rumination is a maladaptive factor which strongly increases depressive symptoms. To acquire additional suggestions, I explored the forms of interaction between self-rumination and problem-solving confidence ($b_2$ coefficient in Figure 2-5). Following Cohen and Cohen (1983), I calculated simple slopes of problem-solving confidence for higher and lower levels (1 *SD* above and below the mean) of self-rumination (Figure 2-6). Simple slopes were significant for high self-rumination ($B = -0.38$, $SE = 0.07$, $t = -5.70$, $p < .001$) but not for lower self-rumination ($B = -0.05$, $SE = 0.07$, $t = -0.71$, $p = .475$). This result suggests that problem-solving confidence can reduce depressive symptoms but if self-rumination is low, confidence cannot reduce depression because depressive symptoms were already low.

## Discussion

In the present study, I first tested the simple multiple mediators model. I hypothesized self-reflection and self-rumination are associated with problem-solving confidence and approach-avoidance style and indirectly with depressive symptoms. However, although approach-avoidance style was associated with self-reflection, it had no association with depressive symptoms. Furthermore, self-rumination appeared to be a moderator interacting with problem-solving confidence. Then, I explored the detailed association between the above variables (except approach-avoidance style) within the framework of moderated mediation. As a result, self-rumination moderated the indirect effect of self-reflection interacting with the mediator problem-solving confidence. Analysis for regions of significance indicated that negative conditional indirect effects of self-reflection on depressive symptoms are significant when the self-rumination score is higher than 34.2 (*M* −0.66 *SD*). Although these results were partially inconsistent with my hypothesis, distinct associations that self-reflection positively related with problem-solving confidence while

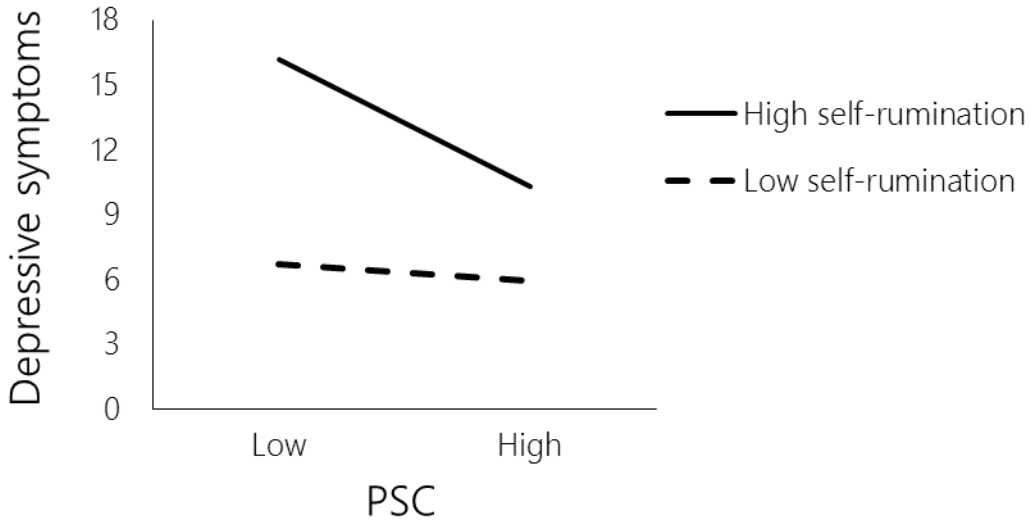


**Figure 2-6.** Conditional associations between predicted depressive symptoms and PSC for high and low levels of self-rumination.

self-rumination had negative associations with these variables are consistent with my prediction and previous findings (Lyubomirsky et al., 1999).

Positive associations between self-reflection and problem-solving confidence is consistent with the theoretical suggestions that self-reflection enhances problem solving (Takano et al., 2011; Takano & Tanno, 2009b; Mori & Tanno, 2013) and accurate self-knowledge of self-reflectors leads to high confidence for problem solving because high problem-solving ability is accurately perceived (Şimşek et al., 2013; Trapnell & Campbell; 1999). On the other hand, previous research has reported that self-reflection was associated with positive reappraisal (Jones et al., 2009). Thus, it should be noted that self-reflectors may more positively appraise their problem-solving abilities than their actual ones, although the positive association between self-reflection and self-knowledge constrains this possibility (Şimşek et al., 2013). Nevertheless, because problem-solving confidence per se has negative associations with psychological maladjustment (Anderson et al., 2009; Elliot et al., 2001), high problem-solving confidence is an adaptive feature of self-reflectors even if whether self-reflection actually contributes to problem solving needs to be examined.

The negative indirect association between self-reflection and depressive symptoms supports my hypothesis. However, tests of conditional indirect effects indicated that self-rumination amplifies the negative indirect effect of self-reflection. At first glance, this result is inconsistent with the notion that self-rumination is a risk factor for depression (Nolen-Hoeksema, et al., 2008; Takano & Tanno, 2009b; Trapnell & Campbell, 1999). This paradox may be due to the positive association between self-rumination and depressive symptoms. Self-rumination positively and moderately correlated with depressive symptoms ($r$ = .45). In the present study, this may have led to the situation that the lower the self-rumination score is, the harder the depressive symptoms score is decreased by problem-solving confidence because it is already low. Tests of simple slopes and interaction form support this notion (Figure 2-6). Although this is a possible explanation for why

self-rumination amplified the conditional indirect effect on depressive symptoms, cross-sectional data is insufficient to test this possibility since it cannot refer to time course-related factors such as "initially" or "already." Future research needs other methodology such as three-wave longitudinal surveys to examine the indirect effect of Time 1 self-reflection on Time 3 depressive symptoms via Time 2 problem-solving confidence controlling for Time 1 depressive symptoms. In addition, the function of self-rumination has to be clarified by investigation of the indirect effect of Time 1 trait self-rumination through Time 2 problem-solving confidence and the moderation effect of state-like self-ruminative thinking during interval between Times 2 and 3.

Although the positive association between self-reflection and active or approaching problem-solving style is consistent with my hypothesis, self-rumination had only marginally significant negative association with active style after controlling for self-reflection. This may be because self-ruminators had both poor problem-solving confidence and tendency toward chronic thinking about personal problems (Nolen-Hoeksema et al., 2008; Trapnell & Campbell, 1999). The items of the approach-avoidance style scale refer to not only the tendency to actively try to solve the problem but also the tendency to carefully analyze personal problems such as "When making a decision, I weigh the consequences of each alternative and compare them against each other." Thus, the nature of dwelling on personal problems in self-ruminators may cancel out and attenuate the negative association between self-rumination and active problem-solving style. In addition, active problem-solving style did not predict depressive symptoms. This finding also contradicts problem-solving theory (Heppner & Peterson, 1982). A possible explanation for this is the absence of actual problems or stressors in the present models. Active problem-solving style reduces depressive symptoms by resolving or modifying the problems rather than the style itself being an adaptive function. Thus, to test the adaptivity of the active problem-solving style, future research needs to examine for the interaction between problem-solving style and problems.

Some limitations require consideration concerning the present study. First, as discussed above, this study relies on cross-sectional data. Following theorists of mediation analysis (e.g., Hayes, 2013), I used the technical terms referring to causal relationships such as direct and indirect "effects" to describe the results of the mediation analysis and the moderated mediation analysis. However, the results of this study were all correlational. To determine the directions of causality and to fully disentangle the present moderated mediation model, longitudinal or experimental designs are required. Second, my data provided relatively small magnitudes of conditional indirect effects of self-reflection. Although mediation analysis basically produces small indirect effects because it is the product of coefficients, the conditional indirect effect of self-reflection was small even for high self-rumination (point estimation = −0.13). This means 1 *SD* change of self-reflection (= 8.0 point raw score change) results in −0.1 *SD* change of depressive symptoms score (= −1.0 point change) when self-rumination is high (*M* + 1 *SD*) without control variable effects. This is possibly because problem-solving confidence per se does not have a substantial contribution to reduce depressive symptoms. Problem solving is a complex process consisting of various factors including problem appraisal, information gathering, solution generation and selection, and solution implementation (D'Zurilla & Nezu, 1990, Heppner & Peterson, 1982). Each of those problem-solving components contributes to the amelioration of depressive symptoms. In particular, actual problem-solving behavior such as planning and solution implementation is considered to have a greater contribution to depression reduction than cognitive components because it can directly resolve or modify the problem, resulting in stress reduction (Aldao et al., 2010). Problem-solving confidence is a cognitive factor of problem solving concerning problem appraisal and perception. Although such cognitive aspects are certainly a part of the problem-solving process, its magnitude of contribution for depression reduction is less than those of actual actions aimed at directly solving problems. Thus, I will investigate the relationships between self-reflection, self-rumination, and actual

problem-solving behavior against everyday problems in Study 2.

## 2.2. Study 2: Self-focus, everyday problem solving, and depressed mood

A positive association between self-reflection and problem-solving confidence was revealed in Study 1. Although problem-solving confidence is considered to reflect problem-solving skills or performance, other components of problem solving must be investigated to elucidate the adaptive function of self-reflection, as discussed in Study 1. Therefore, in Study 2, I examined the relationships between self-reflection, self-rumination, actual problem-solving behavior, and depressed mood. Since success in actual problem-solving behavior can directly eliminate stressors and consequently lead to successful emotion regulation (Aldao et al., 2010), elucidating the contribution of self-reflection for problem-solving behavior can strongly support the adaptivity of self-focused attention on depression. To the best of my knowledge, no previous research has investigated the association between actual problem solving and self-reflection, whereas self-reflection is considered to, as discussed based on control theory (Carver & Sheier, 1990) in Chapter 1, facilitate the progress of self-regulatory cycle which includes problem-solving behavior. On the contrary, ruminative self-focus has been found to be associated with an impaired self-regulatory cycle and problem solving (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999; Martin & Tesser, 1996; Moberly & Watkins, 2010).

For recovery from and prevention of depression, researchers place importance on problem solving in daily life. This is defined as a course of actions with intention to analyze the problems, gather information, generate solutions, or resolve the problem directly (Stone & Neal, 1984). Examples of daily-life problem solving include studying harder for tomorrow's test, asking a colleague for job advice, and having a talk to reconcile with a boyfriend. Such problem-solving behaviors in everyday living can be captured by the Daily Coping Inventory (Stone & Neal, 1984) that requires participants to record their most bothersome problems of the day and how they handled responded to them.

It is possible that the emotional outcomes of problem solving are moderated by the quality and quantity of the problems themselves. Specifically, a highly stressful problem (e.g., death of a loved one) will likely have a more negative impact on an individual's emotional state than a less stressful problem (e.g., being late for class; Myin-Germeys, 2001). This means a high progress rate of self-regulatory cycle in problem-solving behavior for a highly stressful problem can largely reduce negative feelings because, with such a problem, the individual experiences more negative feelings in the first place. Therefore, if self-reflection facilitates both the progress and the emotion regulation aspect of problem solving, individuals with higher levels of self-reflection may be less likely to experience depressed moods following problem-solving behavior for highly stressful situations because these individuals could effectively and efficiently manage their stressful problems. On the other hand, if self-rumination disturbs the problem-solving processes, ruminative individuals will be unable to regulate their depressed moods caused by stressors, despite their attempts to change their stressful circumstances. When a problem's stress level is low, the effect of problem solving may not appear regardless of the level of self-reflection or self-rumination because, under low stress, depressed mood may become low without problem-solving behavior.

The present study examined these potentially moderating roles of self-reflection and self-rumination on the relationship between problem-solving behavior and depressed mood. In particular, the main aim of Study 2 was to explore the adaptive effect of self-reflection on problem-solving behavior. To examine my hypothesis, I employed a diary approach to assess both moods and problem-solving behaviors for seven consecutive days (Stone & Neale, 1984). For daily use, Stone and Neal (1984) developed a dichotomous scale for problem-solving behavior (took the behavior or not) with a brief definition of problem-solving behavior because their study revealed that general checklist-type questionnaires tended to show less validity and lower internal consistency when used daily. Therefore, I used this simplistic assessment to validly capture problem-solving behavior and

reduce the burden on participants. In addition, this diary method allowed me to capture within-person variations in moods and their associations with problem-solving activities that could be employed to deal with participants' everyday problems. Although most of the extant studies on problem solving and emotion regulation measured these variables as stable traits or personality-like concepts, attitudes and intended actions measured by traditional trait-based problem-solving questionnaires have limited correlations with actual behaviors (Anderson et al., 2009). For a full understanding of the emotional functions of problem solving, it is necessary to capture the roles they play "in the ebb and flow of daily life" (Nezlek & Kuppens, 2008, p. 562) by assessing the within-person relationships between daily problem-solving activities and emotional experiences.

## Method

### Participants and Reporting Procedure

Thirty-nine Japanese undergraduate and graduate students (16 men, 23 women) with a mean age of 20.5 years (*SD* = 2.5) participated in a 7-day diary survey. First, participants were informed that participation was voluntary and their answers were confidential. They were also given option of opting out. After agreeing to participate, they completed a baseline questionnaire in the laboratory on the first day, and then kept a diary on the 7 days immediately following this. The diary was completed at the end of each day and comprised multiple measures including ratings of mood, problems encountered, and whether participants utilized problem-solving behaviors throughout the day.

### Daily-Level Variables

**Daily mood.** Participants completed the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971) each night for 1 week. The present study used the Japanese version of the POMS Brief-Form (POMS-BF; Yokoyama, 2005). To rate depressed mood, 15 adjectives were

used—5 assessing negative mood states of depression, 5 assessing fatigue, and 5 assessing positive mood or vigor. Each adjective was rated on a 5-point Likert scale from 0 (*very much unlike this*) to 4 (*very much like this*). The fatigue and vigor subscales were used because fatigue or lack of energy is an important feature of depression (Beck, 1967) and because the vigor subscale has been shown to discriminate depressed from non-depressed individuals well (Christensen & Duncan, 1995). Because these three subscales exhibited moderate correlations with each other (.58 > *r*s > .54, *ps* < .001) after cancelling out the between person variance (i.e. centering by within-person mean), I aggregated them into a single scale by calculating the formula Depression + Fatigue − Vigor in order to avoid the redundancy.[5] A possible range of this aggregated score is from −20 to 40. I estimated the reliability score following Nezlek (2011), which indicated that the aggregated measure was adequately reliable (the reliability score was .65).

**Report of daily problems and problem solving.** Participants completed the Daily Coping Inventory (DCI; Stone & Neale, 1984) after completing the POMS-BF. The DCI measures everyday problem-solving activities undertaken to deal with personal concerns in daily life. In this questionnaire, participants were asked to describe "the most bothersome event or issue of the day." They were instructed that this problem could be something that had happened in the past (e.g., death of a loved one), happened that day, or was expected to happen in the future (e.g., a future job interview). Participants then rated the level of stress the problem created. Scoring occurred on a scale from 1 (a minor annoyance) to 7 (death of a friend or family member). Participants were also asked to indicate, on a dichotomous scale (1 = *Yes*, 0 = *No*), whether or not they had used problem-solving behavior to handle the problem. Problem-solving behavior was defined as thinking about

[5]In regard to the Beck Depression Inventory, my aggregated measure of depressed mood showed a correlation size (*r* = .28) almost compatible to that of the single subscale of depressed mood (*r* = .34). These results do not suggest that the aggregated measure captures depressive symptoms better than the single depressed-mood measure, but I decided to report the results of the aggregated measure for the theoretical and conceptual validity as described in the main text.

solutions to the problem, gathering information about the problem, or doing something to try to solve the problem.

**Person-Level Variables**

**Self-rumination and self-reflection.** Dispositional self-rumination and self-reflection were assessed using the RRQ (Takano & Tanno, 2008; Trapnell & Campbell, 1999).

**Baseline depressive symptoms.** In order to control for baseline depressive symptoms, I administered the Beck Depression Inventory (BDI; Beck et al., 1979). Although the BDI consists of 21 items, I removed 1 item (suicidal thoughts) for ethical reasons that some naive participants may have been influenced by questions of whether or not they had suicidal ideations. Thus, 20 items were used to determine an initial depressive symptoms score.[6] Each item was rated on a 4-point scale (from 0 to 3). In the present study, the Japanese version of the scale (Hayashi, 1988) was used with an alpha coefficient of .84. One participant had two missing values on the BDI, which were replaced with the within-person mean of responses to the other BDI items.

**Statistical Analysis**

Due to the nested structure of the data, I used multilevel modeling to test my hypotheses; within-person variables (i.e., daily depressed mood, problem-solving behavior, and the stress level of the problem) were nested within between-person variables (i.e., self-rumination and self-reflection). Analyses were conducted using the SAS statistical package's (version 9) MIXED procedure and restricted maximum likelihood estimations.

At Level 1 (the within-person level), depressed mood was modeled as a function of problem-solving behavior, stress level, and their two-way interaction, which led to the following

[6]In the early survey period, 12 participants responded to the original 21-item BDI including "suicidal thoughts." I calculated BDI scores for the 12 participants by summing 20 items excluding "suicidal thoughts." Hence, two groups responded to the original or modified BDI, but there was no significant between-group difference in BDI scores.

Level 1 model:

$$Depressed\ mood_{ij} = \beta_{0j} + \beta_{1j} PSB_{ij} + \beta_{2j} Stress_{ij} + \beta_{3j} (PSB_{ij} \times Stress_{ij}) + r_{ij}$$

where $Depressed\ mood_{ij}$ is the depressed mood score on day $i$ for participant $j$. Problem-solving behavior was expressed as $PSB_{ij}$, which was a dummy code indicating 1 for problem-solving behavior and 0 for no problem-solving behavior that day. Because the severity of the problem being addressed would influence the effectiveness of participants' problem-solving efforts (e.g., highly stressful problems would be difficult to manage), the interaction between problem solving and the stress level of the target problem ($Stress_{ij}$) was also included in the equation. The residual was denoted by $r_{ij}$.

To test my main hypotheses, according to which the two subtypes of self-focused attention should moderate the effects of problem-solving behaviors (and stress level of the problem) on depressed mood, I added self-rumination and self-reflection as between-person level variables. The moderating effects of self-reflection and self-rumination were tested in separate models, and thus, the Level 2 (i.e., person-level) equation for self-reflection was described as follows:

$$\beta_{0j} = \beta_{00} + \beta_{01} Ref_j + \beta_{02} Gender_j + \beta_{03} BDI_j + u_{0j}$$

$$\beta_{1j} = \beta_{10} + \beta_{11} Ref_j + u_{1j}$$

$$\beta_{2j} = \beta_{20} + \beta_{21} Ref_j + u_{2j}$$

$$\beta_{3j} = \beta_{30} + \beta_{31} Ref_j + u_{3j}$$

The Level 1 intercept ($\beta_{0j}$) and slopes ($\beta_{1j}$, $\beta_{2j}$, and $\beta_{3j}$) were assumed to vary across participants, including the effects of self-reflection ($Ref_j$) and person-level random effects[7] ($u_{0j}$, $u_{1j}$, $u_{2j}$, or $u_{3j}$). I also included gender ($Gender_j$; 0 = *men*, and 1 = *women*) and baseline depressive symptoms ($BDI_j$)

[7]Because $u_{3j}$ did not converge to a positive value when conducting the analysis about self-reflection, I re-estimated the model, fixing $u_{3j}$ to be zero.

as controls at the Level 1 intercept ($\beta_{0j}$).[8] The most important parameter for my hypothesis testing was $\beta_{31}$, which reflects the three-way interaction effect between self-reflection, problem-solving behavior, and stress level. When testing for the effect of self-rumination, I replaced self-reflection with self-rumination in these equations. Prior to the main analysis, the Level 1 dependent variable (i.e., stress level), except for dichotomous variables (i.e., gender and problem-solving behavior), was person-mean centered, and Level 2 predictors were grand-mean centered to ease interpretation.

## Results

Across 39 participants, 264 diary reports were collected (compliance rate = 96.7%). Descriptive statistics and correlations are shown in Table 2-4. Consistent with previous research (e.g., Trapnell & Campbell, 1999), my data indicated a significant correlation between self-rumination and depressive symptoms ($r$ =.41, $p$ = .010) but not for self-reflection and depression ($r$ = .11, p = .493). For the day-level variables, problem-solving behavior itself did not have a significant association with daily depressed mood ($r$ = −.10, $p$ = .541), although stress exhibited a moderate correlation with daily depressed mood ($r$ = .46, $p$ = .003). The frequency of problem-solving behavior correlated with neither self-reflection ($r$ = .15, $p$ = .361) nor self-rumination ($r$ = .07, $p$ = .687).

Prior to main analyses, I classified reported problems into 3 domains (achievement/academic, interpersonal, and somatic) and tested the relationship between the problem domain and its level of stress. Consequently, 173 problems were in the achievement domain (mean stress level was 2.4, $SD$ = 1.1), 63 interpersonal (mean stress level was 3.2, $SD$ = 1.4), and 28 somatic (mean stress level was 2.6, $SD$ = 1.6). To clarify the effects of these domains, I first tested

[8]To test whether the BDI has any interactions with problem-solving behavior, stress, or self-focus, I also added the BDI score and its interaction with self-reflection to the equation as independent variables for the Level 1 intercept and slopes. Furthermore, I estimated an analogous model replacing self-reflection with self-rumination. Consequently, all interactions including the BDI were significant in neither the self-reflection nor the self-rumination model.

**Table 2-4**

*Descriptive statistics and correlations.*

| | *M* | *SD* | 1. | 2. | 3. | 4. | 5. | 6. |
|---|---|---|---|---|---|---|---|---|
| *Person level variable* | | | | | | | | |
| 1. BDI | 10.6 | 7.4 | — | | | | | |
| 2. Self-reflection | 37.9 | 8.3 | .11 | — | | | | |
| 3. Self-rumination | 42.5 | 7.0 | .41 ** | .19 | — | | | |
| *Daily-level variables* | | | | | | | | |
| 4. Depressed mood | 5.0 | 10.3 | .28 | -.10 | .43 ** | — | -.11 | .41 *** |
| 5. PSB | 0.6 | 0.5 | -.01 | .15 | .07 | -.10 | — | -.04 |
| 6. Stress | 2.6 | 1.3 | .31 | .09 | .18 | .46 ** | -.10 | — |

*Note*. Correlations below the diagonal represent the person-level (N = 39). Daily-level variables were aggregated across the seven days. Correlations above the diagonal represent the day-level (N = 264). Gender is coded 0 = male,1 = female; BDI = Beck Depression Inventory; PSB = Problem-solving behavior. ** $p < .01$, *** $p < .001$.

the effect of domain on stress level. Before the analysis, I made two dummy-coded variables ($x_1$ and $x_2$) indicating the problem's domain with $x_1$ indicating achievement domain (1 = achievement, 0 = not) and $x_2$ indicating interpersonal domain (1 = interpersonal, 0 = not); if both $x_1$ and $x_2$ are 0, it means the problem is in the somatic domain. I conducted the multilevel model in which $x_1$ and $x_2$ predict stress level (both dummy-coded variables and stress are analyzed as daily level variables). As a result, only the dummy-coded interpersonal variable ($x_2$) had a marginally significant and positive effect on stress level ($B = 0.57$, $t = 1.86$, $p = .065$), suggesting interpersonal problems are slightly more stressful than those in other domains. Next, I conducted another multilevel model in which stress, domain, and interaction between stress and domain predicts depressed mood (stress was person-mean centered prior to analysis). This analysis showed that only stress had a significant main effect on depressed mood ($B = 3.00$, $t = 2.51$, $p = .013$). Together, the difference of the domain may be explained by the difference of stress level when predicting depressed mood. Thus, I conducted the following analyses without discrimination of the domain.

**Self-Reflection and Depressed Mood After Problem-Solving Behavior**

First, I tested the hypothesis regarding self-reflection wherein I posited that individuals with higher levels of self-reflection would show lower levels of depressed moods following problem-solving behaviors; I believed that this would be evident even if the problems were highly stressful (Table 2-5). I used the above-mentioned multilevel model in which daily depressed mood was predicted by self-reflection, problem-solving behavior, and problem stress level and their interactions. The results showed a significant main effect of daily problem stress level ($B = 2.75$, $t = 3.68$, $p < .001$), suggesting that, on days when more stressful problems were reported, participants were more likely to experience increased depressed moods. Although none of the two-way interaction effects were significant, the three-way interaction significantly predicted depressed mood ($B = -0.27$, $t = -2.21$, $p = .029$). In order to explore the form of this interaction, conditional effects of problem-solving

**Table 2-5**

*Estimation of Multilevel model predicting depressed mood*

| | *B* (*SE*) | *t* value |
|---|---|---|
| Intercept | 4.98 (1.69) | 2.95 ** |
| *Daily-level variable* | | |
| problem-solving behavior | -2.00 (1.26) | -1.58 |
| stress | 2.75 (0.75) | 3.68 *** |
| *Person-level variables* | | |
| gender | 1.94 (2.16) | 0.90 |
| BDI | 0.24 (0.14) | 1.69 |
| self-reflection | 0.03 (0.15) | 0.21 |
| *Two-way interaction* | | |
| self-reflection × problem-solving behavior | -0.25 (0.16) | -1.58 |
| self-reflection × stress | 0.12 (0.09) | 1.32 |
| stress × problem-solving behavior | 0.03 (1.00) | 0.03 |
| *Three-way interaction* | | |
| self-reflection × problem-solving behavior × stress | -0.27 (0.12) | -2.21 * |
| *Random effcts* | | *z* value |
| Intercept variance | 31.12 (10.53) | 2.96 ** |
| problem-solving behavior variance | 14.67 (11.36) | 1.29 |
| stress variance | 2.26 (2.11) | 1.07 |
| residual variance | 54.17 (5.80) | 9.34 *** |

*Note:* Analyses include 264 days across participants (N = 39). BDI = Beck Depression Inventory.

*$p < .05$, **$p < .01$

behaviors on depressed mood for higher and lower levels (1 *SD* above and below the mean) of the two moderators (i.e., self-reflection and problem stress level) were calculated using my equation (Aiken & West, 1991; Preacher, Curran, & Bauer, 2006; Figure 2-7). The simple slope for higher levels of self-reflection and stress was significant ($B = -6.91$, $z = -2.63$, $p = .008$), but this was not seen in the case of lower self-reflection and higher stress ($B = 3.00$, $z = 1.19$, $p = .236$). The simple slopes were not significant for higher self-reflection and lower stress and for lower self-reflection and lower stress ($B = -1.23$, $z = -0.44$, $p = .660$; $B = -2.85$, $z = -1.19$, $p = .235$). These results support my hypothesis, suggesting that individuals with higher levels of self-reflection were likely to report low depressed moods on the days in which they reported problem-solving behaviors for highly stressful problems.

**Self-Rumination and Depressed Mood After Problem-Solving Behavior**

Next, I tested the hypothesis regarding self-rumination, wherein I posited that individuals with high levels of self-rumination would exhibit high levels of depressed mood despite engaging in problem-solving behaviors to rectify a stressful problem; those with low self-rumination levels, however, would be able to successfully regulate their depressed moods if they engaged in problem solving (Table 2-6). I employed my multilevel model and replaced self-reflection with self-rumination. My results showed significant main effects of stress ($B = 2.74$, $t = 3.82$, $p < .001$) and self-rumination ($B = 0.41$, $t = 2.21$, $p = .032$) in predicting depressed moods, suggesting that individuals with higher levels of self-rumination tended to report higher levels of depressed mood over the diary assessment period. Although I found neither two-way nor three-way interactions among self-rumination, problem-solving behavior, and stress level, the two-way interaction between self-rumination and stress level was marginally significant ($B = 0.19$, $t = 1.98$, $p = .066$). In order to explore the form of this interaction, conditional effects of stress level on depressed mood for higher and lower levels (1 *SD* above and below the mean) of the moderators (i.e., self-rumination) were calculated using my

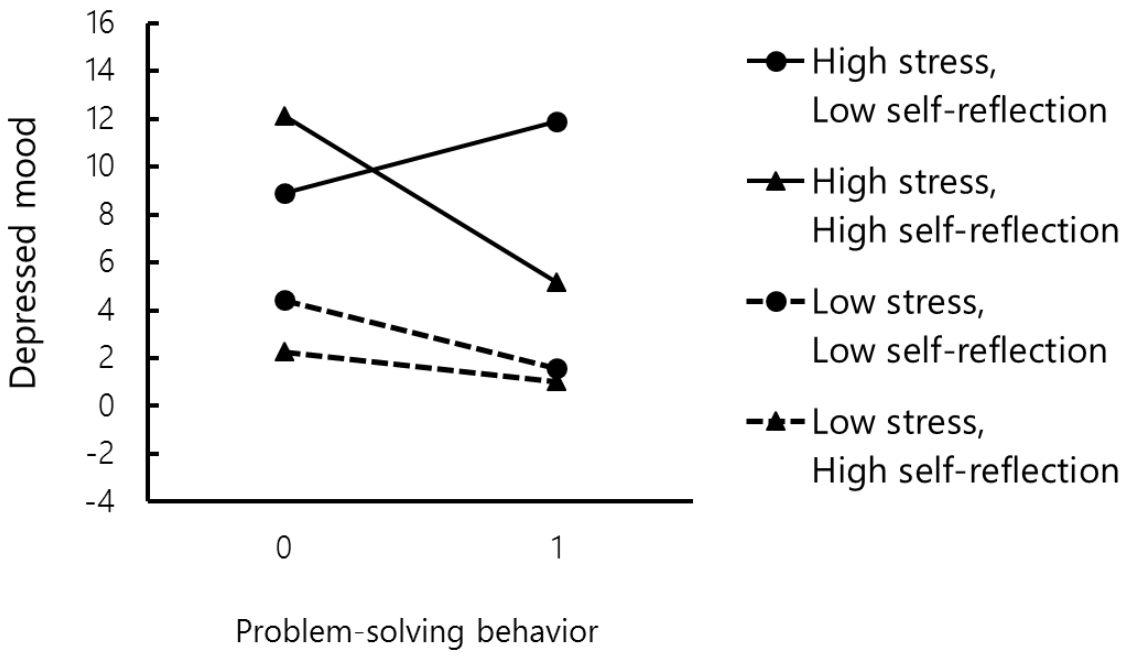


**Figure 2-7.** Conditional effects of problem-solving behavior on depressed mood as a function of self-reflection and problem stress level.

**Table 2-6**

*Estimation of Multilevel model predicting depressed mood*

| | *B* (*SE*) | *t* value |
|---|---|---|
| Intercept | 6.12 (1.62) | 3.77 ** |
| *Daily-level variable* | | |
| problem-solving behavior | -2.05 (1.28) | -1.60 |
| stress | 2.74 (0.72) | 3.82 *** |
| *Person-level variables* | | |
| gender | 0.19 (2.14) | 0.09 |
| BDI | 0.10 (0.15) | 0.67 |
| self-rumination | 0.41 (0.18) | 2.21 * |
| *Two-way interaction* | | |
| self-rumination × problem-solving behavior | -0.08 (0.18) | -0.45 |
| self-rumination × stress | 0.19 (0.09) | 1.98 |
| stress × problem-solving behavior | 0.26 (0.99) | 0.26 |
| *Three-way interaction* | | |
| self-rumination × problem-solving behavior × stress | -0.19 (0.12) | -1.50 |
| *Random effcts* | | *z* value |
| Intercept variance | 23.96 (9.24) | 2.59 ** |
| problem-solving behavior variance | 18.21 (11.96) | 1.52 |
| stress variance | 1.30 (2.78) | 0.47 |
| stress × problem-solving behavior variance | 0.19 (3.70) | 0.05 |
| residual variance | 55.82 (6.04) | 9.24 *** |

*Note:* Analyses include 264 days across participants (N = 39). BDI = Beck Depression Inventory.

*$p < .05$, **$p < .01$

equation (Figure 2-8). The simple slope was significant for higher levels of self-rumination ($B$ = 4.06, $z$ = 3.87, $p$ < .001), but not lower levels ($B$ = 1.42, $z$ = 1.58, $p$ = .114). Although the non-significant higher-order interaction effect does not support my hypothesis that self-rumination prevents the emotion regulation function of problem-solving behavior, the pattern of the interaction between self-rumination and stress suggests that individuals with higher levels of self-rumination tend to exhibit higher levels of depressed mood upon experiencing a high-intensity stressor.

Finally, I tested the possibility that self-reflection and self-rumination interact with each other in predicting depressed mood. To test this, I simultaneously added self-reflection, self-rumination, and their interactions into a multilevel model as Level 2 predictors. Consequently, the estimated model included additional 3-way interactions (i.e., self-reflection × self-rumination × problem-solving behavior and self-reflection × self-rumination × stress) and a 4-way interaction (self-reflection × self-rumination × problem-solving behavior × stress). The results showed that neither 3-way nor 4-way interactions related to self-reflection and self-rumination were significant ($ps$ > .165). This result suggests that self-reflection and self-rumination independently associate with depressed mood.

## Discussion

Using a diary assessment of problem solving and moods, the present study investigated the moderating effects of the two subtypes of self-focused attention on the relationships between problem-solving behavior and depressed mood. The results showed that self-reflection interacted with problem-solving behavior and problem stress level, predicting daily depressed moods. The form of this interaction suggests that individuals with higher levels of self-reflection reported lower depressed mood when they tried to solve a highly stressful problem; in other words, only highly self-reflective people experience the benefit of problem-solving behavior when the stress level is

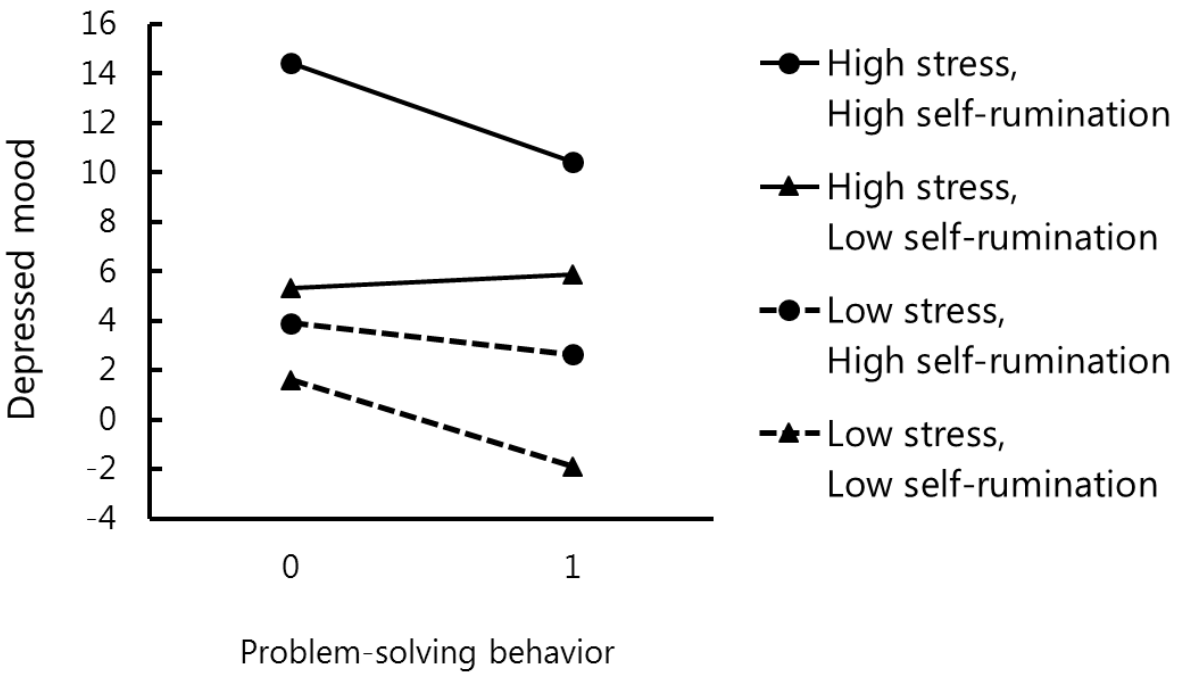


**Figure 2-8.** Conditional effects of problem-solving behavior on depressed mood as a function of self-rumination and stress level of the problem.

high. This finding supports my prediction that self-reflection plays an adaptive role in problem solving. Although self-rumination showed no significant interaction with problem-solving behavior, the interaction between self-rumination and stress level was marginally significant. This result suggests that self-ruminative people are modestly vulnerable to stress, consistent with previous research (Nolen-Hoeksema & Morrow, 1991; Takano et al., 2011).

The enhanced emotion regulation for self-reflective individuals supports the theoretical suggestion that certain types of self-focus have beneficial outcomes, including reduced negative affect, increased positive affect, and decreases in anxiety and depression (Martin & Tesser, 1996; Watkins, 2008). Such benefits of self-focused attention are considered to appear when self-focus facilitates the self-regulatory cycle aimed at the achievement of personal goals and a reduction in self-discrepancy (Carver & Scheier, 1982, 1990; Pyszczynski & Greenberg, 1987). As proposed by proponents of control theory (e.g., Carver & Scheier, 1990), self-regulatory goals and behaviors would be hierarchically organized from superordinate goals (e.g., idealized self-image) to subordinate goals (e.g., be kind) and actual behaviors (e.g., shovel snow off walks). Theorists have argued that the proper translation of the superordinate goals into the subordinate goals and specific action plans would lead to adaptive outcomes in difficult or stressful situations (Watkins, 2008), because the enhanced rate of goal progress is closely associated with increases in both confidence and positive feelings and decreases in doubt and negative affect. Since self-reflection is motivated by curiosity about the self and is associated with clear self-knowledge (Şimşek et al., 2013; Trapnell & Campbell, 1999), it can help to translate superordinate goals into the concrete actions that are most suitable to one's ability and circumstances. Thus, self-reflection could contribute to a well-organized hierarchy in the self-regulatory cycle, resulting in greater problem-solving success. This speculation is consistent with recent research showing a significant association between a curious personality type (i.e., openness to experience) and higher trait problem-solving ability (D'Zurilla,

Maydeu-Olivares, & Gallardo-Pujol, 2011).

As another possible explanation, self-reflection contributes to emotion-regulation through positive appraisal. Previous research suggested the association between self-reflection and positive reappraisal (Jones et al., 2009). Therefore, individuals with high self-reflection possibly make positive appraisal, which is known to facilitate negative emotion regulation (Garnefski & Kraaij, 2006), on the results of problem-solving behavior, even if the results are not, in fact, good. To elaborate the mechanism underlying the adaptive effect of self-reflection on problem-solving behavior, future research needs objective measures (e.g., proofreading test score; Lyubomirsky, Kasri, & Zehm, 2003) to differentiate the objective effectiveness of problem-solving behavior from participant's subjective appraisal.

Contrary to my hypothesis, the three-way interaction between self-rumination, problem-solving behavior, and problem stress level was not significant. This null interaction effect indicates that the emotional influences of problem-solving behaviors would not be different between either self-rumination levels or daily problem stress levels. However, self-rumination had a significant main effect and marginally significant interaction with the stress level in predicting depressed mood. These results suggest that individuals inclined towards self-rumination tend to experience higher levels of depressed mood over the one-week sampling period, and they may further exacerbate these moods after encountering high-intensity stressors. The interaction between depressive rumination and stressful experiences has been consistently reported in previous studies, suggesting that ruminative self-focus amplifies stress-induced negative moods because such individuals are prone to focusing on unresolved goals and self-discrepancies (Kraaij, Garnefski, & Wilde, 2003; Skitch & Abela, 2008). While this mood-exacerbation effect was argued to be caused by disturbed problem-solving processes resulting from negative ruminative thinking (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999), this moderating role of self-rumination was

not supported in my data. This is possibly because my assessment of problem-solving behavior focused on participants' immediate actions in response to daily stressors that were taken before the day was over. If I had tracked the course of emotion regulation processes after the initial problem-solving actions, the deleterious influences of self-rumination may have become more evident. This lag is likely since self-rumination may interrupt problem-solving behavior such that highly ruminative people cannot manage to finish problem solving before the day is over. Indeed, an empirical study showed that induced rumination increased the time for solving the task, suggesting that ruminative thinking disrupts the concentration by its cognitive load (Lyubomirsky et al., 2003). Such delay effect of self-rumination on problem solving can be associated with the senses of frustration, self-doubt, and depressed feelings (Carver & Scheier, 1990).

Another possible reason for the non-significant interaction between self-rumination and problem-solving behavior is that dichotomous assessment of problem-solving behavior was not sufficiently sensitive to how people were ruminating. As introduced above, previous researchers have suggested that harmful effects of depressive rumination on problem solving stem from the depletion of cognitive resources by ruminative or interfering thoughts (Lyubomirsky et al., 2003). There is a possibility that problem-solving behaviors reported in the present study ranged from ones requiring more cognitive resources (e.g., planning for the complex problem) to ones requiring fewer resources (e.g., routine work). Thus, if I assessed the cognitive load of problem-solving behavior, I may have observed the interaction between self-rumination and highly effortful problem-solving behavior.

In addition, the non-significant correlation between self-rumination and the frequency of reported problem-solving behavior appear to be inconsistent with previous research revealing that individuals with depressive rumination lack the motivation for problem solving (Lyubomirsky et al., 1999; Ward, Lyubomirsky, & Nolen-Hoeksema, 2003). As discussed above, ruminative individuals

may be unable to finish problem solving within one day. A possible explanation is that ruminative people tended to continue working on one problem over several days, and I counted such longer problem-solving behavior repeatedly due to my once-a-day assessment methodology. If I had assessed all problems of the day and participants' reactions, I would have found that individuals with high self-rumination can handle only few problems within a day. Similarly, even if the individuals with high self-reflection actively tried to solve their problems, once-a-day assessment was not enough to capture all their problem-solving behaviors. I measured only one problem-solving behavior for the most stressful problem per day. While my results showed that self-reflection was not associated with frequency of problem-solving behavior for the most bothersome issue of the day, highly self-reflective people may actively try to solve moderately or slightly stressful problems. In fact, Study 1 showed a positive association between self-reflection and the approaching problem-solving style, using a measure for general orientation toward problems. Short-term assessment also may be useful for test the association, such as investigating the style in single problem-solving attempt (e.g. how much or less exerts one's effort in a problem-solving task).

My findings should be cautiously interpreted in light of several important limitations. First, I did not specify whether the everyday problem-solving behaviors led to actual goal achievement. Goal success is an important parameter that influences mood states, as indicated in an experience sampling study that suggested that the combination of low goal success and high goal importance was associated with increased negative moods (Moberly & Watkins, 2010). Despite even mental simulation aimed at resolving personal problems alleviating negative emotions triggered by stressful events and enhancing positive emotions (Rivkin & Taylor, 1999), research has yet to confirm that the reflective form of self-focus facilitates the problem-solving process. Developing quantitative and objective assessment of the progress provides a stringent test for this hypothesis.

In addition, I could not capture the main effect of problem-solving behavior on depressed

mood. These non-significant effects may be caused by the retrospective nature of the DCI. One possibility is that the end-of-day methodology is too retrospective such that participants could not accurately indicate whether they did problem-solving behavior. Furthermore, if they engaged in problem-solving behavior earlier in the day, its effect may have attenuated before the end of the day. To fully disentangle such temporal relationships, I have to estimate lagged effects using an autoregressive model. Nevertheless, since the DCI can provide much fewer measurement times per person than the Experiences Sampling Method (ESM), it is difficult to robustly estimate the autoregressive model. I have used a diary method because other methodology, such as ESM, per se interrupts problem-solving behavior. However, future research needs to employ alternative methodology such as the Day Reconstruction Method (Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004) to assess temporal effects.

Moreover, to discuss the relationship between depressed mood and problem stress level, other valuables remain to be considered; namely, the tendency to report negative feelings. Such a tendency may cause a spurious correlation between stress level and depressed mood. To be sure, it is preferable to use physiological indices such as heart rate for assessing stress responses. Nevertheless, I controlled the BDI scores that reflect negative cognitive biases. Therefore, personal tendency to report negative feelings was controlled to a certain degree.

My sample size is relatively small, which reduced statistical power. One possibility is that less statistical power leads to non-significant results such as interaction between person-level variables (i.e., self-reflection and self-rumination). In particular, negative mood in college students is typically not particularly serious, nor does it last very long. In fact, the reported daily depressed mood ($M$ = 5.0, $SD$ = 10.3 with a possible range from −20 to 40) and the reported problem stress level ($M$ = 2.6, $SD$ = 1.3 with a possible range from 1 to 7) were not high. To generalize my findings to other populations, future research needs to be conducted with different participants such as

people in other development stages or depressed patients.

## 2.3. Study 3: Self-focus and objectively and quantitatively evaluated problem solving

Although Study 1 and 2 suggest that self-reflection enhances problem solving, they were unable to measure actual problem-solving performance. In Study 3, I attempted to objectively and quantitatively assess problem-solving performance as an indicator of goal success and lowered negative self-discrepancy. For this aim, I focused on problem solving in academic contexts. The academic problem (i.e., academic underachievement) and its resolution are often defined as quantifiable examination scores. Scholastic problems are related to depression (Fergusson & Woodward, 2002; Hilsman & Garber, 1995; Metalsky, Abramson, Seligman, Semmel, & Peterson, 1982), similar to interpersonal issues (e.g., Gunthert, Cohen, Butler, & Beck, 2007) and problems at the workplace (e.g., Tennant, 2001). For instance, in their early work with undergraduates, Metalsky et al. (1982) reported that a low grade on an examination interacted with a maladaptive attributional style in contributing to depressive symptom onset. Because academic performance has a central role in children's, adolescents', and undergraduate students' lives, academic underachievement also has a negative impact on mental health in younger populations (e.g., Hilsman & Garber, 1995; Metalsky et al., 1982). Thus, elucidating whether self-reflection enhances academic performance can help develop strategies to promote psychological adjustment.

Since the findings in Study 1—self-reflectors demonstrate approaching problem-solving style—were not replicated in Study 2, the number of problem-solving behaviors was measured in Study 3 in addition to performance on problem-solving tasks. Daily measurement in Study 2 was not sufficient to accurately assess approaching or active style of self-reflectors. Although Study 1 and 2 assessed general approaching style and once-a-day problem solving, in Study 3, I examined the number of problem-solving behaviors in a short-term learning task to determine whether self-reflectors actively or passively attempted to solve problems. I also investigated patterns of problem-solving behaviors to examine their effectiveness because, whereas the style that actively implements

the solution is an important aspect of problem-solving ability, the effectiveness of solution is also important to heighten problem-solving performance (D'Zurilla & Nezu, 1990). That is, Study 3 examined how self-focused attention predicts the amount and pattern of problem-solving behaviors, thereby predicting problem-solving performance on a learning task.

Substantial research has reported on the effectiveness of *distributed practice*, multiple short learning sessions over a longer period, as a learning strategy (for reviews, see Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006; Son & Simon, 2012). For instance, 10-min daily learning sessions over three days yield higher scores than a single 30-min session. Theories on distributed practice have proposed that such distributed or spaced learning sessions lead to practice in different situations, with more contextual cues for recalling specific memories (Glenberg, 1979). Additionally, the interval between two study opportunities provides sufficient time to consolidate memory (Wickelgren, 1972). Further, distributed-study items are given more attention—leading to deep processing—compared to repeated consecutively presented items, as they are often perceived to be familiar (deficient-processing model; e.g., Cuddy & Jacoby, 1982). Here, considering learning behavior is one of self-regulatory behavior, resource model of self-regulation (Baumeister, Bratslavsky, Muraven, & Tice, 1998) can also partially explain the distributed-practice effect. Self-regulation quickly consumes internal resources needed for further self-regulation, resulting in *ego depletion* (Baumeister et al., 1998). Intervals between study sessions possibly facilitate recovery from ego depletion and contribute to efficient learning in subsequent sessions. The recovery hastens especially when the interval involves pleasurable activities because positive mood or emotion can restore internal resources (Tice, Baumeister, Shmueli, & Muraven, 2007). Son and Simon (2012) used an analogy similar to the resource model of self-regulation to explain the deficient-processing model of distributed practice, "where one is performing a motor task: If we were to mass our physical training for too long, our muscles would not have time to recharge, and would fail to get

the full benefits of the ongoing training" (p383).

This model suggests what individual differences affect strategy use in learning. Appropriate breaks, or distractions (Nolen-Hoeksema, 1991; Nolen-Hoeksema et al, 2008), require accurate monitoring on one's state; that is, judgement whether oneself is in ego depletion or energetic. Reflective self-focused attention is considered to contribute to this monitoring function as it is associated with the accuracy of self-knowledge (Şimşek, et al., 2013; Trapnell & Campbell, 1999) and possibly helps detect discrepancies between the ideal and actual self, thereby indicating the extent of ego depletion. Furthermore, previous studies have linked self-reflection with other variables related to problem solving, such as positive reappraisal tendency that can lead to generate alternative solutions (Jones, et al., 2009), and autonomous self-regulation (Thomsen, et al., 2011) which can contribute to implement of problem solutions. Therefore, self-reflection is hypothesized to play an adaptive role in learning through better planning and implementation of solutions and by promoting spontaneous intermittent rest in short-term learning sessions—operationalized as a greater number of learning behaviors and a learning pattern characterized by fluctuation (i.e. distributed by spontaneous rest)—resulting in high test scores.

It should be noted that previous researchers have studied distributed practice as one of learning strategies which is taught by teachers to students. However, recent researchers have investigated the spontaneous use of spacing or distributing strategy and they have suggested that college-aged students prefer spaced learning (for a review, see Son & Simons, 2012). In this line, Study 3 focused spontaneous distributed practice. However, this is certainly different from the traditional concept of distributed practice that is given by the instructor and this difference may also produce different effects on the study results. Hence, I here emphasize that the fluctuated pattern of learning in the present study represents "spontaneous spacing of learning" but does not indicate distributed practice as a given learning strategy.

Contrary to self-reflection, self-rumination is considered maladaptive to learning. Empirical studies have revealed that ruminative self-focus biases problematic situations, reduces one's motivation for problem solving, and impairs solution generation (Lyubomirsky et al., 1999; Ward et al., 2003). Regarding actual problem-solving behavior in academics, experimental research found that when self-rumination was induced in dysphoric individuals, they exhibited impaired concentration on a reading task, a proofreading task, and viewing a videotaped lecture (Lyubomirsky et al., 2003). Specifically, individuals who ruminate take longer to complete tasks and demonstrate impaired work strategy, reduced comprehension of task content, and poorer task performance compared to distraction manipulation, suggesting that increased ruminative thinking depletes cognitive resources (Seibert & Ellis, 1991) and disturbs self-regulation in learning. This maladaptive effect of ruminative thinking on learning and problem solving may explain depressive individuals' academic underachievement. As self-rumination interferers with concentration, the number of learning behaviors are hypothesized to decrease among self-ruminators. Regarding the pattern of learning behaviors, self-ruminators would exhibit a fluctuating pattern because ruminative thoughts repeatedly interrupt learning behaviors. Even if self-ruminators exhibit fluctuating pattern, few number of problem-solving behaviors would result in low test scores.

The present study also examined the effect of achievement motives—dispositional variables derived from need for achievement that drive individuals towards achievement (McClelland, Atkinson, Clark, & Lowell, 1953) —on learning and problem solving. Traditionally, achievement motive is regarded as one of social motivation that orients individuals towards socially or culturally valued goals (Murray, 1938), for example, it predicts academic performance (Steinmayr & Spinath, 2008, 2009). Meanwhile, researchers have argued multiple distinct aspects of achievement motive such as social versus personal need achievement (Bendig, 1964). In same vein, prior research has distinguished self-fulfillment achievement motive from competitive achievement motive (Horino,

1987; Horino & Mori, 1991). While competitive achievement motive is a variation of traditional achievement motive, which is oriented toward socially valued self in relation to others' performance, self-fulfillment achievement motive is defined as a motive to achieve one's own reference that independent of social appraisal or external evaluation (Horino, 1987; Horino & Mori, 1991). In the present study, I examined these two subtypes of achievement motives. It can be hypothesized that both subtypes of achievement motive would increase learning behavior (e.g., the motive to do better than others or satisfy curiosity). Since individuals with high competitive achievement motive aim to perform better than others, they would be more likely to engage in continuous learning, while individuals with high self-fulfillment achievement motive would prefer to learn at their own pace, involving patterns of fluctuation with a varying number of learning behaviors.

It is important to control these motives in order to accurately estimate the effects of self-reflection and self-rumination on academic underachievement as they have underlying motivational factors (Trapnell & Campbell, 1999). In their original study, Trapnell and Campbell (1999) posited that self-reflection is motivated by epistemic interest in the self, and that self-rumination is motivated by threat, loss, or injustice to the self, demonstrating the associations between self-reflection and openness to experience and between self-rumination and neuroticism. Epistemic self-oriented motive is possibly associated with self-fulfillment motive, whereas the negative motivation of self-rumination is possibly commensurate to competitive motive. In fact, previous research has reported that self-rumination is associated with inferiority complex (Nakajima, Mori, & Tanno, 2014). Therefore, motivational factors need to be controlled to investigate the self-monitoring functions of these two subtypes of dispositional self-focus.

The present study examined the effects of two types of self-focus and two types of achievement motives on problem solving in academic contexts with a pseudo academic

underachievement situation in the laboratory. I measured the scores on a word–meaning matching test using unfamiliar words, and the number of Web searches aimed at preparing for the test in order to quantitatively assess learning behavior, patterns, and performance, as well as distinguish between actual actions from mental activities such as planning. Although planning or mental rehearsal is a problem-focused activity (Folkman & Lazarus, 1980) that contributes to alleviating negative emotions and increases active coping (Rivkin & Taylor, 1999), it fundamentally differs from executing problem-focused actions and does not directly alter problematic situations (Carver, Scheier, & Weintraub, 1989). Furthermore, different plans generate different solutions each of which present different challenges for implementation. To avoid confounding effects by different planning strategies and solutions, I constructed an academic problem-solving task with only one solution: searching for the definitions of unknown words.

My hypothesis states that individuals with higher levels of self-reflection would exhibit more number of and fluctuated pattern of problem-solving behaviors, thereby obtaining higher test scores compared to self-ruminative individuals who would engage in fluctuated but very few problem-solving behaviors, resulting in lower test scores. Motivational factors are considered to affect behavior. That is, competitive achievement motive would result in more problem-solving behaviors and higher test scores. Similarly, self-fulfillment motive would result in more problem-solving behaviors with a fluctuating pattern. Thus, I tested a mediation model in which self-focus and achievement motive predict the number of searches for unfamiliar words and fluctuations in searches, which in turn predict test scores.

## Method

### Participants

Participants were 39 Japanese undergraduate students (22 men, 17 women); their mean age was

19.2 years (*SD* = 0.9). They were informed that participation was voluntary, their answers were confidential, and they had the option to opt out at any time.

## Materials

### Baseline Questionnaires

**Self-reflection and self-rumination.** Self-reflection and self-rumination were measured by the Rumination-Reflection Questionnaire (RRQ).

**Achievement Motives.** Trait motives for achievement were measured using the Achievement Motive Scale (Horino, 1987). This scale comprises two subscales: self-fulfillment achievement motive (α = .80) —the motivation to achieve something in one's own way (e.g., "I want to cultivate myself by learning many things" and "I think it is important to work hard in my own way rather than defeat others")—and competitive achievement motive (α = .86), the motivation to achieve something better than others and to heighten one's social status (e.g., "I want very much to be superior to others" and "Efforts for study and work are ensure that I never lose to others").

### Academic problem-solving task

**Word–meaning matching test.** After completing baseline questionnaires, participants completed a word–meaning matching test, adopted from a practice book of the Graduate Record Exam (Geer, 2010). This test consisted of 30 word–meaning matching items, with total scores ranging 0–30. Thirty words were listed with assigned numbers on a sheet of paper (word-list) and their meanings were listed with entry fields on another sheet (meaning-list). Participants were instructed to match each word with its definition within 15 min, by writing the word number in entry field on the meaning list for what they thought was the correct definition of the word. Participants were informed of the number of correct responses and were told that they had scored below average (negative feedback) to simulate an academic underachievement situation. They answered same test again after free time. The order of test words and definitions were randomized

in the second test.

**Visual analogue scales.** Visual analogue scales (VAS) were used to measure current levels of depressed and anxious moods in response to negative feedback. Two 100 mm scales were presented labelled "not at all depressed/feel anxiety" at one end, to "extremely depressed/feel anxiety" at the other. Each mood score ranges 0–100.

**Problem-solving behavior.** After the first word–meaning matching test, the experimenter returned the word-list to participants and allowed them to browse any websites on a laptop in the lab room during the 30-min free time. In this task, successful problem solving was defined as obtaining higher scores compared to the first test, and solution was defined as searching for the meanings of test words. For problem-solving behavior, I measured the number of times participants searched for definitions of test words. I logged browsing history from the first Web access until the end of the free time and recorded the number of times the participant accessed material that was relevant (e.g., accessing a web dictionary) and irrelevant to the test (i.e., all other web activity). In the present study, the number of problem-solving behaviors was represented by a *search rate* calculated as

$$\frac{(the\ number\ of\ test\ related\ activity)}{(the\ number\ of\ test\ related\ activity) + (the\ number\ of\ test\ unrelated\ activity)} \times 100$$

In other words, the number of test-related activity divided by the number of all web activities. This rate definition may yield a stronger association with test scores than simply counting test related activities, as it accounts for unrelated items.[9] To calculate fluctuations in problem-solving behavior, I calculated search rate per min from the first web access to after passing 30-min for each participant.[10]

[9] In fact, search rate had slightly larger correlation with second test scores ($r$ = .72) than did only test related activities ($r$ = .68).
[10] When the number of all web activities per min was zero, search rate could not be calculated. In this case, I defined search rate as zero, emphasizing the absence of searching behavior.

**Fluctuations in problem-solving behavior.** The Mean Squared Successive Differences (MSSD) was proposed by von Neumann, Kent, Bellinson, and Hart (1941) to capture temporal fluctuation, variability, or instability the sequentially measured variable. In the present study, I calculated the MSSD of problem-solving behavior in terms of search rate per min defined by

$$MSSD = \frac{1}{n-1}\sum_{i=1}^{n-1}(SR_i - SR_{i+1})^2$$

where $n$ is the number of measurement occasions (i.e., 30) and $SR_i$ denotes search rate at *i*th min. Thus, a large MSSD size indicates that the search rate largely varies about every one min. Large fluctuations in search rates implies that a participant sometimes searched more frequently, sometimes accessed irrelevant pages, or was spontaneously spaced learning sessions with unrelated activities in between. I also calculated the within-subject average search rate per min to assess total problem-solving behaviors.

**Procedure**

An overview of the procedure is presented in Figure 2-9. Participants were tested individually. After completing baseline questionnaires, they were instructed to answer the VAS to indicate their current negative mood. They then completed the word–meaning matching test (first test; Figure 2-9), after which they were given negative feedback (the problem, defined in this study) and answered the VAS again. Following this, participants were seated in front of a laptop and were allowed to browse any Internet site in the lab room during the 30-min free time (implementation of solution). They were instructed as follows: “After 30 minutes free time, you will answer same word–meaning matching test. Do as you please during this free time. You can search the test words using the Internet and can browse any websites. It doesn't matter if you do not use the PC. ” This instruction was to explicitly provide participants a problem-solving solution and the option to implement the solution or not. After free time, they answered second test (problem-solving performance) after

which they were debriefed.

**Statistical Analysis**

I used mediation analysis to examine the indirect effects of self-reflection, self-rumination, self-fulfillment achievement motive, and competitive achievement motive on the second test scores through within-subject mean search rate and MSSD, and controlling for the first test scores and depressed and anxious moods after receiving negative feedback (Figure 2-10). Analyses were conducted using SPSS version 22.0 and SPSS macro (MEDIATE; Hayes & Preacher, 2014).

## Results

Descriptive statistics of variables and their correlations are presented in Table 2-7. The first test score average was 5.9 ($SD$ = 2.8) out of 30, suggesting that the test was difficult for participants. A significant correlation was observed between self-reflection and self-rumination ($r$ = .32, $p$ = .043). Self-reflection was correlated with self-fulfillment achievement motive ($r$ = .52, $p$ < .001) and self-rumination demonstrated a marginally significant correlation with competitive achievement motive ($r$ = .31, $p$ = .059), supporting my hypotheses about motivational factors of dispositional self-focus. Within-subject mean search rate per min was not significantly correlated with self-reflection ($r$ = .17, $p$ = .317) or self-rumination ($r$ = .11, $p$ = .488). Further, self-fulfillment ($r$ = –.26, $p$ = .108) and competitive achievement motives were not significantly correlated with within-subject mean search rate ($r$ = –.03, $p$ = .847). MSSD of search rates per min was correlated only with self-reflection ($r$ = .35, $p$ = .031). Both within-subject mean ($r$ = .71, $p$ < .001) and MSSD of search rates were positively correlated with second-test scores ($r$ = .62, $p$ < .001).

Regarding negative feedback, the paired $t$-tests between baseline and post-feedback

depressed/anxious mood showed significant increases of depressed ($t(38) = 4.62$, $p < .001$) and anxious mood ($t(38) = 2.83$, $p = .007$), suggesting that participants perceived undesirable self-

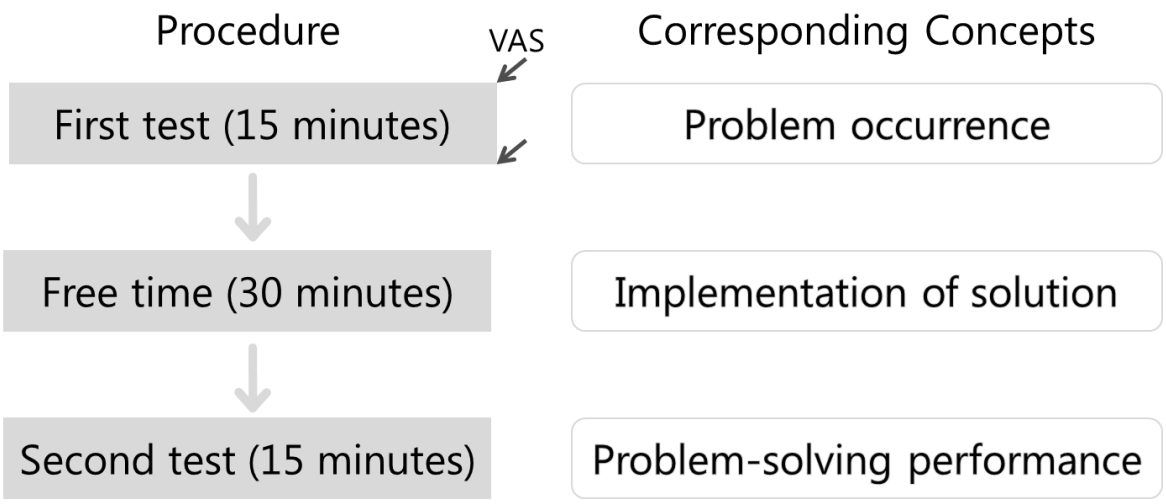


**Figure 2-9.** An overview of the task. VAS = Visual analogue scales.

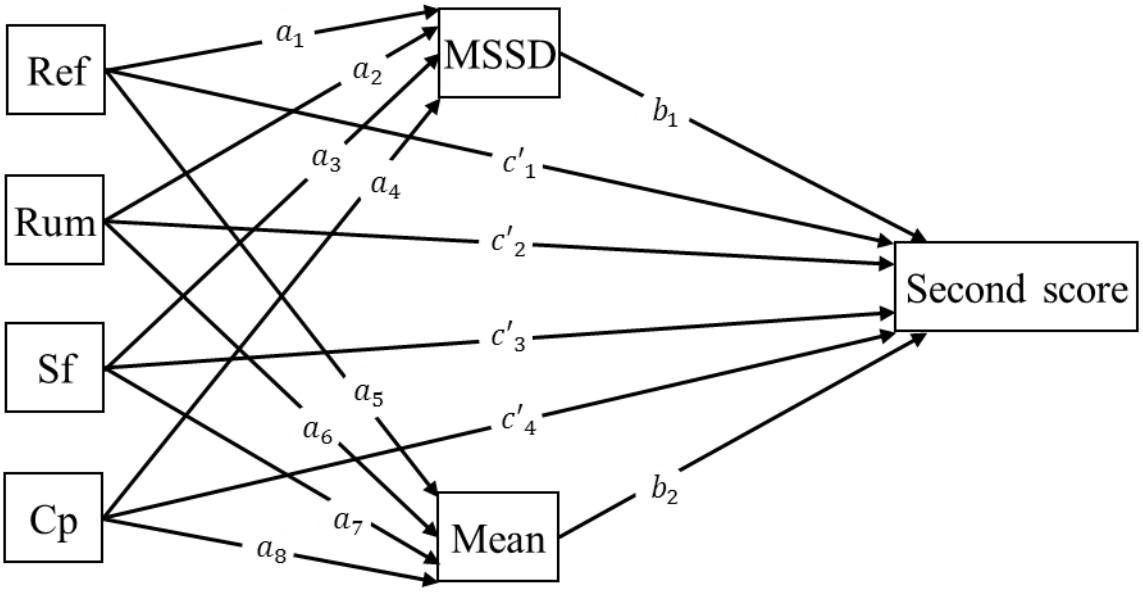


**Figure 2-10.** Conceptual presentation of the present model. Ref = Self-reflection; Rum = Self-rumination; Sf = Self-fulfillment achievement motive; Cp = Competitive achievement motive; MSSD = MSSD of search rate; Mean = Within-person mean of search rate. For ease of presentation, covariates (i.e. first test score, depressed mood, and anxious mood) are not shown.

**Table 2-7**

*Descriptive statistics and correlations.*

| | *M* | *SD* | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Self-reflection | 39.2 | 9.9 | — | | | | | | | | | | |
| 2. Self-rumination | 43.1 | 8.0 | .33 * | — | | | | | | | | | |
| 3. Sf | 70.1 | 8.9 | .52 *** | .18 | — | | | | | | | | |
| 4. Cp | 51.4 | 8.5 | .13 | .31 † | .00 | — | | | | | | | |
| 5. First-test score | 5.9 | 2.8 | -.00 | .19 | -.05 | -.16 | — | | | | | | |
| 6. Seocnd-test score | 14.3 | 6.9 | .16 | .18 | -.24 | -.00 | .27 † | — | | | | | |
| 7. Whithin-person mean of SR | 34.0 | 20.9 | .17 | .11 | -.26 | -.03 | .15 | .71 *** | — | | | | |
| 8. MSSD of SR | 1741.2 | 1318.9 | .35 * | .19 | -.08 | .03 | .06 | .62 *** | .66 *** | — | | | |
| 9. Pre anxious mood | 32.6 | 23.3 | .01 | .43 ** | -.12 | .26 | .13 | .01 | .07 | .25 | — | | |
| 10. Post anxious mood | 40.6 | 24.2 | -.20 | .37 * | -.14 | .19 | .04 | -.06 | .05 | .20 | .72 *** | — | |
| 11. Pre depressed mood | 24.5 | 21.0 | .16 | .42 ** | .02 | -.05 | -.07 | -.09 | -.11 | .04 | .67 *** | .54 *** | — |
| 12. Post depressd mood | 38.5 | 26.1 | .06 | .42 ** | -.02 | .00 | .07 | -.00 | -.02 | .16 | .65 *** | .78 *** | .70 *** |

*Note.* Sf = Self-fulfilment achievement motive; Cp = Competitive achievement motive; SR = Search rate per minute.

†$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$.

discrepancy, or perceived the scores as a stressful problem. In addition, within-subject increments for depressed /anxious mood was not significantly correlated with self-reflection (depressed mood: $r = -.09$, $p = .580$; anxious mood: $r = -.28$, $p = .080$), self-rumination (for depressed mood: $r = .12$, $p = .466$; anxious mood: $r = -.05$, $p = .742$), self-fulfillment achievement motive (depressed mood: $r = -.05$, $p = .756$; anxious mood: $r = –.03$, $p = .835$), and competitive achievement motive (depressed mood: $r = .06$, $p = .700$; anxious mood: $r = -.09$, $p = .604$), suggesting that the effect of the negative feedback did not differ according to level of self-focus or achievement motives. However, only self-reflection demonstrated a marginally significant and negative correlation with increments in anxious mood ($r = -.28$, $p = .080$), suggesting that self-reflectors' anxious mood is more stable when they experience underachievement or self-reflectors can lower their anxiety by positive reappraisal (Jones et al., 2009). It should be noted that depressed and anxious mood after negative feedback were strongly correlated with each other ($r = .78$, $p < .001$). Therefore, I excluded depressed mood from the mediation analysis to avoid multicollinearity but included anxious mood because it possibly reflects test anxiety, which is known to impair test performance (e.g., Cassady & Johnson, 2002).

I tested the mediation model wherein scores on the second test is predicted by self-reflection, self-rumination, and self-fulfillment and competitive achievement motives, after controlling for scores on the first test and anxious mood after negative feedback, and these relationships are mediated by within-subject mean search rate and MSSD of search rate per min (Table 2-8; Figure 2-11). Multiple regression analyses showed that only self-fulfillment achievement motive had a significant negative total effect on second-test scores ($c_3$; $B = -0.35$, $SE = 0.14$, $p = .019$). Regarding problem-solving behavior, self-reflection significantly predicted MSSD of search rate ($a_1$; $B = 82.46$, $SE = 25.45$, $p = .003$) and within-subject mean search rate ($a_5$; $B = 0.90$, $SE = 0.42$, $p = .041$). Self-fulfillment achievement motive negatively predicted MSSD of search rate ($a_3$; $B = -52.81$, $SE = 25.92$, $p$

= .050) and within-subject mean search rate ($a_7$; $B$ = −1.12, $SE$ = 0.43, $p$ = .014). Furthermore, anxious mood had marginally significant effect on MSSD ($B$ = 16.53, $SE$ = 9.47, $p$ = .091; not shown in Figure 2-11). To test the effects of mediators and the direct effects of independent variables, I conducted a multiple regression analysis in which second-test scores were predicted by all independent variables, covariates, and mediators.[11] The result showed that MSSD of search rate significantly predicted second-test scores ($b_1$; $B$ = 0.002, $SE$ = 0.001, $p$ = .038) after controlling for the effect of within-subject mean search rate ($b_2$; $B$ = 0.14, $SE$ = 0.05, $p$ = .011). This result suggests that fluctuating learning is effective after controlling for total learning behaviors. On the other hand, direct effects of independent variables ($c'$ paths) were not significant. However, a covariate—anxious mood—had a marginally significant and negative direct effect ($B$ = −0.07, $SE$ = 0.04, $p$ = .073), consistent with previous research (Cassady & Johnson, 2002).

In order to test the indirect effects of independent variables on second-test scores via MSSD and mean search rate, I estimated 95% confidential intervals (CI) of these indirect effects by bias corrected bootstrapping with 10,000 resamples (Hayes & Preacher, 2014). The results showed that the indirect effect of self-reflection through MSSD of search rate (point estimate = 0.16; 95% CI [0.02, 0.36]) and within-subject mean search rate (point estimate = 0.13; 95% CI [0.02, 0.34]) differed significantly from zero (at $p$ < .05), suggesting that individuals with tendency for self-reflection performed better at the task by engaging in more problem-solving behaviors and through fluctuating pattern of behaviors. Self-fulfillment achievement motive had a negative indirect effect through within-subject mean search rate (point estimate = −0.16; 95% CI [−0.40, −0.04]), and demonstrated marginally significant (at $p$ < .10) negative indirect effect through MSSD (point estimate = −0.10; 90% CI [−0.27, −0.01]), suggesting that individuals with high levels of self-

[11] Test of homogeneity were not significant for MSSD and within-subject mean search rate per min (*ps* > .319). Therefore, I did not test the interactions between independent variables and mediators.

**Table 2-8**

Multiple regression analyses of multiple mediators model

| | Estimation of *c* paths, predicting Seond score | | | Estimation of *a* paths, predicting MSSD | | | Estimation of *a* paths, predicting Mean | | | Estimation of *b* and c' paths, predicting Second score | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *B* | (*SE*) | *t* | *B* | (*SE*) | *t* | *B* | (*SE*) | *t* | *B* | (*SE*) | *t* |
| Predictors | | | | | | | | | | | | |
| First-test score | 0.54 | (0.40) | 1.35 | 14.01 | (73.95) | 0.19 | 0.76 | (1.23) | 0.62 | 0.40 | (0.29) | 1.38 |
| Self-reflection | 0.23 | (0.14) | 1.65 | 82.46 | (25.45) | 3.24 ** | 0.90 | (0.42) | 2.13 * | -0.06 | (0.12) | -0.50 |
| Self-rumination | 0.14 | (0.17) | 0.86 | -6.81 | (30.99) | -0.22 | 0.12 | (0.52) | 0.24 | 0.14 | (0.12) | 1.14 |
| Sf | -0.35 | (0.14) | -2.47 * | -52.81 | (25.92) | -2.04 * | -1.12 | (0.43) | -2.60 * | -0.09 | (0.11) | -0.76 |
| Cp | -0.03 | (0.13) | -0.24 | -14.03 | (24.99) | -0.56 | -0.24 | (0.42) | -0.59 | 0.03 | (0.10) | 0.29 |
| Anxious mood | -0.03 | (0.05) | -0.66 | 16.53 | (9.47) | 1.75 † | 0.06 | (0.16) | 0.37 | -0.07 | (0.04) | -1.86 † |
| MSSD | | — | | | — | | | — | | 0.00 | (0.00) | 2.18 * |
| Mean | | — | | | — | | | — | | 0.14 | (0.05) | 2.70 * |
| adjusted $R^2$ | .12 | | | .16 † | | | .08 | | | .53 *** | | |

*Note*. Dep = Depressive symptoms, PSC = Problem-solving confidence, AAS = Approaching-avoidance style.

†$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$

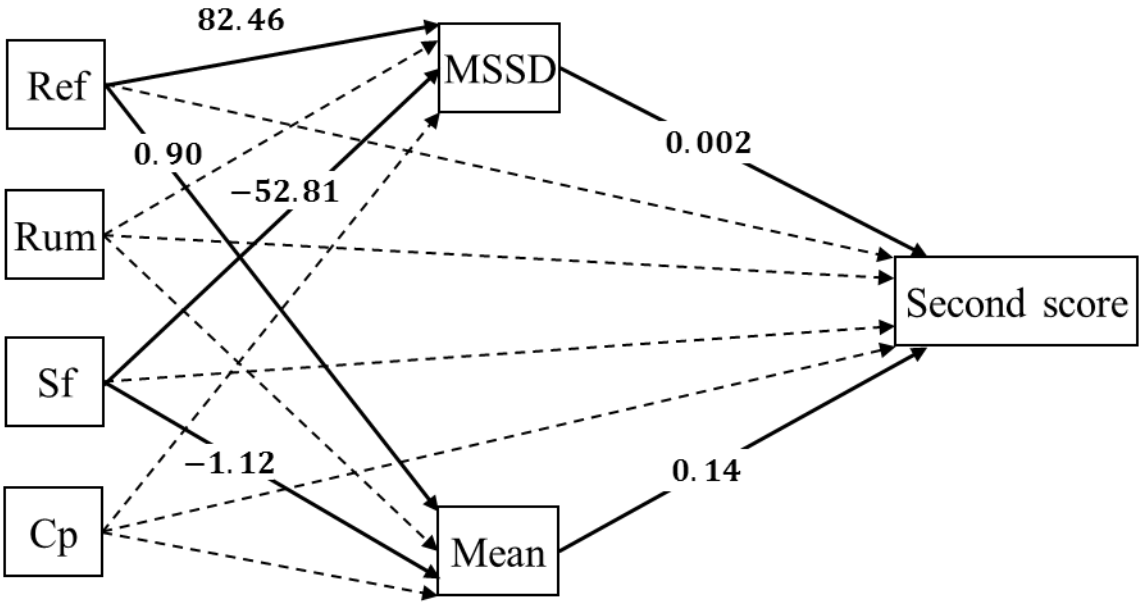


**Figure 2-11.** Result of mediation analysis, showing *a*, *b*, *c'* paths. Ref = Self-reflection; Rum = Self-rumination; Sf = Self-fulfillment achievement motive; Cp = Competitive achievement motive; MSSD = MSSD of searching rate; Mean = Within-person mean of searching rate. For ease of presentation, covariates (i.e. first test score and anxious mood) are not shown. In addition, only significant path coefficients (*B*) are shown on solid lines ($p < .05$). Broken lines mean non-significant path ($p > .05$).

fulfillment achievement motives tend to be less effortful during problem solving. Furthermore, anxious mood had a positive indirect effect on second-test scores through MSSD (point estimate = 0.03; 95% CI [0.00, 0.10]). This indicates that although anxious mood had a direct negative effect on test performance, it also had indirect positive effects through fluctuated learning.

## Discussion

Using a problem-solving task in academic settings, the present study investigated the relationships among two types of self-focus, two achievement motives, problem-solving behavior (i.e., search rate), and problem-solving performance (i.e., second-test score). Although the results showed that self-rumination did not influence problem-solving behavior and performance, individuals with higher self-reflection showed more problem-solving behaviors, more fluctuation, and higher task score than those with lower self-reflection, after controlling for trait achievement motives. This suggests that self-reflection facilitates and enhances problem solving. However, the achievement motives results contradict my hypotheses. Competitive achievement motive did not influence academic problem solving while self-fulfillment achievement motive negatively affected performance.

The results support the theorization that certain types of self-focus can facilitate problem-solving behavior (Martin & Tesser, 1996; Watkins, 2008). According to control theory, self-focused attention monitors problem-solving progress rate (Carver & Scheier, 1990). Underestimating progress rates is thought to evoke negative emotion, resulting in withdrawal from problem-solving behaviors (Pysczcynski & Greenberg, 1987) or negative rumination, which disturbs concentration on ongoing tasks (Lyubomirsky et al., 2003). In contrast, overestimating progress rates may generate positive emotion if it is perceived to be higher than a standard (Carver & Scheier, 1990; Pysczcynski & Greenberg, 1987). However, this results in underestimating necessary efforts,

potentially leading to reduced efforts. Since self-reflection is motivated by curiosity about the self and is associated with self-knowledge (Şimşek et al., 2013; Trapnell & Campbell, 1999), it can help accurately estimate progress rates and facilitate problem-solving behaviors. Moreover, the present results suggest that self-reflection may help individuals concentrate on problem solving without engaging in ruminative thinking about unattained goals and experiencing negative emotions. Focusing on unattained goals generally evokes negative emotion, although the role of self-focused attention is considered to monitor the discrepancy between the current and ideal self (Pyszczynski & Greenberg, 1987). Self-ruminators are considered to tend to focus on this evoked negative emotion and to ruminate about the meaning of and causes for this emotion, resulting in interfering problem-solving behavior. Indeed, previous research found that dysphoric individuals induced to engage in ruminative thinking generated more interfering thoughts and were less able to concentrate on academic tasks (Lyubomirsky et al., 2003). In contrast, it is possible that self-reflectors can shift their attention from ruminative thoughts about unattained goals and negative emotion to problem solving more easily compared to individuals with a higher level of self-rumination or lower level of self-reflection. A recent study using self-reports has shown that while self-reflection is positively associated with attentional function, self-rumination was negatively associated with attentional function (Kamijo & Yukawa, 2014).

Furthermore, consistent with my hypothesis, self-reflectors exhibited fluctuations in learning that resulted in improved test scores. The positive association between fluctuation and performance may be attributed to more contextual recall cues (Glenberg, 1979) and restoration of internal resources (Tice et al., 2007). Since MSSD of search rate only reflects fluctuations per min and does not reflect the order of the search or time intervals between first, second, and subsequent searches, it is unclear whether fluctuated learning in this study increased consolidation time (Wickelgren, 1972) for memorizing of each word's meaning. In addition, it was not possible to

classify participants' behaviors when they were not searching for words since only web access histories were logged. For instance, when participants did not use the laptop, they may have mentally rehearsed words and their meanings. Thus, the MSSD results must be interpreted with caution. However, if fluctuations did help participants recover from ego-depleted states, these patterns demonstrated by self-reflectors may be attributed to accurate self-monitoring which is acquired by enhanced attentional function of self-reflectors (Kamijo & Yukawa, 2014) because judging the need for rest requires accurate self-monitoring. Future research needs to investigate participants' behaviors when they do not use the PC. Despite some limitations in interpretation, the present study indicated that self-reflectors exhibited an active, effective problem-solving style. This result suggests that self-reflection is an adaptive type of self-focused attention that can properly reduce the negative self-discrepancy magnitude.

Contrary to my hypothesis, self-rumination did not affect problem-solving behavior and performance. This is inconsistent with previous research which shows that ruminative thinking impairs problem-solving ability by lowering motivation for problem solving, leading to fewer and ineffective solutions, and impairing concentration (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999; Lyubomirsky et al., 2003). However, several previous studies have primarily investigated interpersonal problem solving (e.g., Lyubomirsky & Nolen-Hoeksema, 1995). A possible explanation for this non-significant effect is that, at least among healthy individuals, self-rumination does not impair problem solving for tasks that require fewer cognitive resources. In the present study, participants were given a single and easily implemented solution (i.e., searching for the test words on the laptop and memorizing the definitions) to control the adverse effects of self-rumination on planning. Thus, the present task that did not require the generation and selection of solutions may have been easy and required fewer cognitive resources than effortful cognitive activities such as planning for and implementing solutions of complex

problems (e.g., interpersonal). Previous research has suggested that the negative effects of induced ruminative thinking on problem solving stems from the depletion of cognitive resources by ruminative or interfering thoughts (Lyubomirsky et al., 2003). This suggestion, however, proposes that self-rumination may not disturb relatively automatic tasks or those that require fewer cognitive resources. Another possible explanation for the non-significant results is that since I assessed trait self-rumination, it is ambiguous whether self-ruminators actually engaged in ruminative thinking. In addition, maladaptive effects of ruminative thinking have been often observed with depressed or dysphoric individuals but with individuals without depressive symptoms (Lyubomirsky et al., 2003; Lyubomirsky & Nolen-Hoeksema, 1999; see also, Nolen-Hoeksema et al., 2008). Although individuals with trait self-rumination tend to ruminate and experience depressed mood (e.g., Trapnell & Campbell, 1999), it is possible that only some self-ruminators ruminated frequently and were deeply depressed in the present task.

Moreover, controlling for anxious mood may attenuate the effects of self-rumination because it is considered to increase anxiety after a threatening event (Trapnell & Campell, 1999). In the present study, self-rumination was correlated with anxious mood after negative feedback ($r$ = .37), and anxious mood had a direct negative effect on test scores. In addition, anxious mood also had an indirect positive association with test scores through MSSD of learning behavior. Although this is inconsistent with previous findings (e.g., Cassady & Johnson, 2002; Culler & Holahan, 1980), it may be explained by test anxiety theory, according to which test anxiety is multidimensional (Lowe & Lee, 2008) and involves psychological (e.g., interfering anxieties), physiological (e.g., physiological arousal), and social factors (e.g., interpersonal pressures). That is, while some factors of test anxiety (e.g., pressure) possibly impairs test performance, others may enhance the performance. In particular, test anxiety is considered to increase interfering anxieties (Cassady & Johnson, 2002) in a similar fashion as self-rumination is hypothesized to elicit

interfering thoughts that result in increased fluctuations in learning behavior. Hence, individuals who experienced anxious mood may have repeatedly experienced interfering anxieties that led to increased MSSD, which counterintuitively contributed positively to test performance. Therefore, controlling for anxious mood may have attenuated the effects of self-rumination on MSSD of search rate. Furthermore, this positive indirect effect of anxious mood may have canceled out its negative direct effect, resulting in a non-significant total effect of anxious mood. This finding is supported by a recent meta-analytical review that reported negative but relatively weak correlations between test anxiety and academic performance (Richardson, Abraham, & Bond, 2012).

Results about achievement motives were also inconsistent with my hypotheses. Competitive achievement motive did not affect the pattern and within-subject average of problem-solving behaviors. In the present study, participants were instructed to "do as you please," implying that implementing solution was not imposed. Individuals with high competitive achievement motive may have been found it valuable to exert effort in this experimental situation as it was not obviously linked to social values nor imposed externally. On the other hand, self-fulfillment achievement motive negatively affected within-subject and MSSD of problem-solving behaviors, resulting in an indirect negative effect on task performance. This negative effect might be robust because self-fulfillment motive negatively predicted the number of problem-solving behaviors ($B = -0.91$, $SE = 0.39$, $p = .024$) even after replacing the within-subject and MSSD of search rate with simply counted test-related activities in the present model. Self-fulfillment motive is considered to strongly enhance task performance especially when the goal corresponds to a personal, unique goal (e.g., "I want to use my goodness by doing something incomparable to others rather than competing with others"). In the present study, the negative feedback regarding participants' performance in relation to others may have demotivated those with a tendency for self-fulfillment motive because the feedback may have heightened participants' awareness of the competitiveness of the situation. This

may have continuously lowered their efforts, resulting in low within-subject average and low fluctuation of problem-solving behaviors. This result also implies self-fulfillment motives in self-reflectors may unconstructively function in competitive situation. Furthermore, although the achievement motives employed in this study focus on the type of goal, they do not distinguish between their approaching and avoidant aspects (McClelland et al., 1953). Approaching motive positively predicted academic grade, whereas avoidant motive had either a negative effect or no effect on school performance (Steinmayr & Spinath, 2008, 2009). Although I used competitive and self-fulfillment achievement motives to control for potential competitive motives in self-rumination (Nakajima et al., 2014) and self-fulfillment motives in self-reflection (Trapnell & Campbell, 1999), other aspects of achievement motives need to be explored to understand how achievement motive affects learning or problem-solving performance.

The present study has a number of limitations. First, I defined fluctuation in learning behavior as [test related activities / (test related activities + test unrelated activities)]. Although this definition assessed distributed learning behavior spaced by web activities unrelated to learning, it did not measure distribution spaced by the periods that participants did not use the laptop. MSSD of search rate was more strongly correlated with second test score ($r = .62$, $p < .001$) than MSSD of test related activities did ($r = .45$, $p = .004$); intermittent distraction may have restored internal resources (Tice et al., 2007), resulting in better performance than just time intervals. However, future researchers need to investigate distributed learning with differing time intervals. Further, I did not consider the sequence of learning; I did not specify the order in which participants searched for test words. In distributed practice theory, if two learning episodes of an item are separated by a learning episode of another item (e.g., learning item A and B in the order: item A, item B, and item A), the first item (item A) is learned by distributed practice spaced by other study items (item B), not by unrelated activities or resting (Cepeda et al., 2006). Although I excluded this sequential

effect to avoid complicating the present model, future research needs to examine the type of distributed practice to understand the individual differences in use of spontaneous spacing of learning. Second, the study cannot explain why fluctuation occurred and whether participants' fluctuations in learning behavior were intentional or unconscious/automatic. This implies that my suggestions largely speculative. In particular, I discussed why fluctuation may have been caused by self-reflection (i.e., through self-monitoring function) and anxious mood (i.e., through interfering thoughts) but these explanations need to be examined using other methods such as thought sampling.

Third, because participants were not required to solve the task, their engagement in learning behavior depended on their motivation. However, in real life, several problems require to be resolved regardless of will or motivation. Therefore, future research needs to investigate the effects of self-focus and achievement motives on unavoidable tasks.

Although self-reflection is associated with adaptive variables that may contribute to problem solving such as interpersonal skills (Takano et al., 2011), autonomous self-regulation (Thomesen et al., 2011), and self-knowledge (Şimşek et al., 2013), the present study is the first to demonstrate a direct relationship between self-reflection and actual problem-solving performance. Thus, the association between self-reflection and more complex problem solving such as interpersonal conflict should be examined. Furthermore, self-rumination and self-reflection were treated as traits in the present study; thus, it is unclear whether high self-reflectors/self-ruminators actually engaged in self-reflective/self-ruminative thinking during the present task. Yet, previous studies that have linked rumination with impaired problem solving experimentally induced ruminative thinking (e.g., Lyubomirsky et al., 2003; Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky, et al., 1999). To examine the effect of induced self-reflection or measure state-like self-reflection, an alternative methods need to be established.

## 2.4. Summary of Chapter 2

In Chapter 2, I explored the associations between self-focused attention, problem solving, and depressive symptoms, focusing on general problem-solving confidence (Study 1), daily-basis relationships (Study 2), and the objective and quantitative measurements of problem-solving behaviors and its performance (Study 3). Study 1 revealed, through a cross-sectional survey, that self-reflection is positively related to general problem-solving confidence, whereas self-rumination is related to low confidence. However, self-rumination also interacted with problem-solving confidence when predicting depressive symptoms. Although this relationship cannot be completely elucidated through a cross-sectional study, the results of Study 1 at least suggest that self-reflectors are confident in problem-solving but self-ruminators are not. In Study 2, I employed the dairy method for further exploration and ecological validation of these findings. I found that self-reflection interacted with the existence or non-existence of problem-solving behavior and problems' stress intensity in predicting depressed mood at the end of the day. This result suggests that self-reflectors can effectively manage their everyday problems. Since both Studies 1 and 2 relied on self-report measurements of problem-solving related variables, their results cannot indicate whether self-reflection is related to actual problem-solving behavior and performance. Thus, in Study 3, I devised an academic problem-solving task to measure objectively and quantitatively actual problem solving. Results revealed that self-reflectors exhibited high problem-solving performance through active and effective problem-solving styles.

Although Studies 1, 2, and 3 consistently indicate an association between self-reflection and enhanced problem-solving ability, further detailed examinations are difficult to conduct since only trait measurement of self-reflection is possible and researchers cannot experimentally induce or measure state-like self-reflective thinking because self-reflection is not well defined. In the next chapter, I will explore the nature of self-reflection in relation to problem solving and depression.

# Chapter 3: The associations between reflective and ruminative self-focus and decentering

## 3.1. Study 4: Cross-sectional associations between self-focus, decentering, and depressive symptoms

Series of my studies in Chapter 2 revealed that reflective self-focused attention had associations with enhanced problem-solving ability. However, the contents, valence, or mode of self-reflective thinking remain unclear since self-reflection is proposed in the context of its relationships with motivation and the Big Five (Trapnell & Campbell, 1999), and questionnaire items for self-reflection provide less specific examples of contents of self-reflective thinking (e.g., "I love analyzing why do I things."). For this reason, the detailed mechanism of its contribution to psychological adjustments is not well understood. In the present study, I aimed to examine the nature of self-reflection, contrasting it with maladaptive self-rumination. Such attempts can contribute to revitalizing research into adaptive self-focus and, consequently, accumulating evidence for the adaptivities of self-focused attention, leading to suggestions of effective and efficient treatment methods for depressive disorders. Because the results in Chapter 2 suggest that self-reflection contributes to problem solving, it may be possible that self-reflectors can accurately monitor the negative self-discrepancy without falling into ruminative thinking, which can contribute to reducing the discrepancy (i.e., successful problem solving). Therefore, I explored the function of self-reflection in relation to decentering (Teasdale et al., 2002) to elucidate its adaptivity.

As discussed in Chapter 1, decentering, or ability to objectively observe one's internal experiences such as thoughts and feelings (Fresco, Moore et al., 2007; Teasdale et al., 2002), can differentiate functions of self-reflection and self-rumination. Recent researchers have posited that mindfulness-based cognitive behavior therapy reduces depressive symptoms by cultivating ability

to take a decentered perspective, which theoretically counteracts ruminative self-focused thinking (Campbell et al., 2012; Fresco, Moore et al., 2007; Teasdale et al., 2002). In short, decentering mediates between mindfulness training and its effect on reduction of depressive symptoms (Fresco, Segal et al., 2007). Although the concept of decentering is proposed to explain why mindfulness training is effective for reducing depressive symptoms, suggesting that decentering counteracts ruminative self-focus, this can also explain why trait self-rumination increases depressive symptoms. The tendency toward ruminative self-focusing produces difficulty in maintaining a decentered perspective, resulting in immersion into negative internal experiences and, consequently, exacerbating depressive symptoms. In the present study, I hypothesized that self-rumination is associated with increased depressive symptoms via reduced decentering.

Contrary to self-rumination, self-reflection is considered to be related with a highly decentered perspective. Decentering can mediate self-reflection and its adaptive outcomes such as self-knowledge clarity (Şimşek et al., 2013) and reduced depressive symptoms (Mori & Tanno, 2013; Takano & Tanno, 2009b). Decentered perspective is considered to contribute to acquiring self-knowledge without negative bias and to the buffering effect of stressors on depressive symptoms (Mori & Tanno, 2013). Furthermore, decentered perspective is required for proper monitoring in self-regulatory behavior (Inzlicht et al., 2014; Teper et al., 2013). Self-reflectors may maintain a decentered perspective when monitoring negative self-discrepancy, which can enhance their problem-solving ability. Consistent with these notions, prior research has reported that self-reflection is moderately correlated with decentering ($r$ = .42, Lau et al., 2006) as measured by the Toronto Mindfulness Scale (TMS). I hypothesized, therefore, that self-reflection is indirectly associated with low levels of depressive symptoms, and this association is mediated by decentering.

It should be noted that the TMS is designed to be administered after meditating (Lau et al., 2006). However, the present study focuses on whether individuals high in self-reflection can

spontaneously take a decentered perspective in everyday life. Hence, I employed the Experiences Questionnaire (EQ; Fresco, Moore et al., 2007), which asks participants to indicate whether they took a decentered perspective in "recent events." Thus, the first aim of the present study was to confirm the previous finding (i.e., positive association between self-reflection and decentering; Lau et al., 2006) using another decentering measurement (i.e., the EQ). The second and main purpose of the present study was to distinguish between maladaptive and adaptive functions of self-focused attention by examining the mediating role of decentering in the relationships among self-reflection, self-rumination, and depressive symptoms. My hypothesis states that self-reflection is associated with low levels of depressive symptoms via high levels of decentering. On the other hand, self-rumination may have a relationship with high levels of depressive symptoms, which is mediated by low levels of decentering.

## Method

### Participants

Two-hundred and forty-nine Japanese undergraduate students (136 men, 113 women) completed a questionnaire packet in introductory psychology classes at two Japanese universities. Their mean age was 19.6 years (*SD* = 2.1). Gender was binary coded (0 = *male* and 1 = *female*).

### Instruments

**Self-Rumination, Self-Reflection and Depressive symptoms.** Self-rumination and self-reflection were assessed by the RRQ, and depressive symptoms are assessed by the BDI-II.

**Decentering.** To assess decentering, I used the Experiences Questionnaire (Fresco, Moore et al., 2007). The EQ consists of two subscales assessing decentering (13 items, e.g., "I am better able to accept myself as I am") and rumination (7 items, e.g., "I think over and over again about what others have said to me"), and each item was rated on a 5-point scale ranging from 1 (never) to

5 (all the time). The rumination subscale of the EQ was included as a control against response bias (Fresco, Moore et al., 2007); the present study analyzed not the rumination subscale of the EQ but, rather, the self-rumination subscale of the RRQ. The EQ does not assess dispositional decentering ability; it provides how the answerer took a decentered perspective in "recent experiences". In the Japanese sample, confirmatory factor analyses revealed that the Japanese version of the decentering subscale consists of 10 items (Kurihara et al., 2010). A prior study has shown that the Japanese version of the decentering subscale had adequate internal consistency ($\alpha = .78$) and validity (Kurihara et al., 2010); the same internal consistency was found in the present study ($\alpha = .78$).

**Procedure and Analyses**

Prior to data collection, students were informed that participation was voluntary and that their answers were confidential and would not be connected to their school records. I collected data from participants who signed the informed consent form. Statistical analyses were conducted using SPSS version 22.0. To test the mediation model, I used the SPSS macro script (MEDIATE; Hayes & Preacher, 2014).

## Results

Table 3-1 provides descriptive statistics and correlation matrix. Although self-rumination was positively associated with depressive symptoms ($r = .54$, $p < .001$), self-reflection had no association with depressive symptoms ($r = .10$, $p = .124$). Decentering was negatively associated with depressive symptoms ($r = -.45$, $p < .001$). These results were consistent with previous research (Fresco, Moore et al., 2007; Trapnell & Campbell, 1999). Consistent with my prediction and confirming previous findings (Lau et al., 2006), decentering was correlated positively with self-reflection ($r = .24$, $p < .001$) and negatively with self-rumination ($r = -.37$, $p < .001$). Self-reflection and self-rumination were correlated with each other ($r = .26$, $p < .001$), which may be because of their shared variance of self-consciousness (Trapnell & Campbell, 1999). Following Baron and

**Table 3-1**

*Descriptive statistics and correlations.*

| | *M* | *SD* | 1. | 2. | 3. |
|---|---|---|---|---|---|
| 1. Depressive symptoms | 11.7 | 8.0 | — | | |
| 2. Decentering | 27.6 | 5.5 | -.45 *** | — | |
| 3. Self-reflection | 38.4 | 8.2 | .10 | .24 *** | — |
| 4. Self-rumination | 42.6 | 7.7 | .54 *** | -.37 *** | .26 *** |

*** $p < .001$.

Kenny (1986), I next tested the mediation model in which depressive symptoms are predicted by self-reflection and self-rumination and these relationships are mediated by decentering (Figure 3-1; Table 3-2). To test the total effects on depressive symptoms, I conducted a multiple regression analysis in which self-reflection and self-rumination predicted depressive symptoms, controlling for gender. Self-reflection did not predict depressive symptoms ($c_1$ path: $B = -0.04$, $SE = 0.05$, $p = .428$), but self-rumination predicted them significantly ($c_2$ path: $B = 0.57$, $SE = 0.06$, $p < .001$). The covariate (i.e., gender) did not predict the depressive symptoms ($B = -0.30$, $SE = 0.86$, $p = .724$). Adjusted $R^2$ of this regression equation was significant (adjusted $R^2 = .29$, $F(3, 245) = 34.07$, $p < .001$). I then conducted a multiple regression analysis predicting decentering with the same independent variables as in previous regression equation. The results showed that self-reflection significantly predicted higher decentering ($a_1$ path: $B = 0.24$, $SE = 0.04$, $p < .001$), while self-rumination significantly predicted lower decentering ($a_2$ path: $B = -0.33$, $SE = 0.04$, $p < .001$). Gender did not predict decentering ($B = 0.29$, $SE = 0.61$, $p = .634$). Adjusted $R^2$ of this regression equation was significant (adjusted $R^2 = .25$, $F(3, 245) = 28.22$, $p < .001$). To test the association between the mediator and depressive symptoms, I calculated a final regression equation in which depressive symptoms were predicted by self-reflection, self-rumination, and decentering, controlling for gender. The results showed non-significant main effects of self-reflection ($c'_1$ path: $B = 0.07$, $SE = 0.06$, $p = .220$) and significant main effects of self-rumination ($c'_2$ path: $B = 0.42$, $SE = 0.06$, $p < .001$) and decentering ($b$ path: $B = -0.45$, $SE = 0.09$, $p < .001$). Gender had no association with depressive symptoms ($B = -0.17$, $SE = 0.81$, $p = .834$). This regression equation showed significant and adequately large adjusted $R^2$ (adjusted $R^2 = .36$, $F(4, 244) = 35.55$, $p < .001$).

In order to test the indirect effects of self-reflection and self-rumination on depressive symptoms via decentering, I estimated the 95% confidential intervals of these indirect effects using a bias-corrected bootstrap method with 10,000 resamples according to Hayes and Preacher (2014).

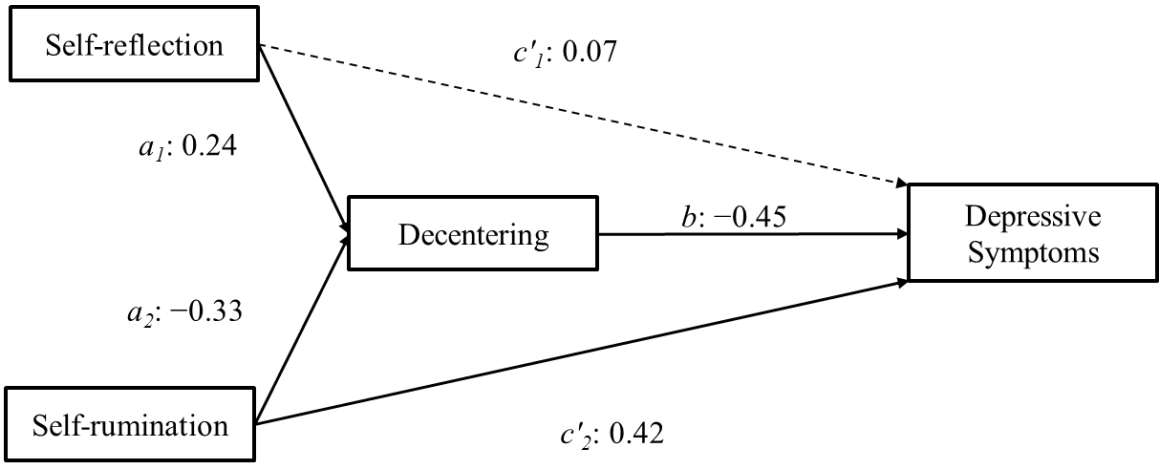


**Figure 3-1.** The estimated mediation model, in which self-reflection and self-rumination associate with depressive symptoms directly and indirectly via decentering. Unstandardized coefficients (*B*) are presented. All analyses include a covariate (i.e., gender), but it is not shown for ease of presentation. Solid lines are significant paths ($p < .05$) and broken lines are non-significant or marginally significant paths ($p > .05$).

**Table 3-2**

*Multiple regression analyses of mediation model*

| | Estimation of *c* paths, predicting Dep | | | Estimation of *a* paths, predicting Decentering | | | Estimation of *b* and *c′* paths, predicting Dep | | |
|---|---|---|---|---|---|---|---|---|---|
| | *B* | (*SE*) | *t* | *B* | (*SE*) | *t* | *B* | (*SE*) | *t* |
| Predictors | | | | | | | | | |
| Gender | −0.30 | (0.86) | −0.35 | 0.29 | (0.61) | 0.48 | −0.17 | (0.81) | −0.21 |
| Self-reflection | −0.04 | (0.05) | −0.79 | 0.24 | (0.04) | 6.34 *** | 0.07 | (0.06) | 1.23 |
| Self-rumination | 0.57 | (0.06) | 9.93 *** | −0.33 | (0.04) | −8.05 *** | 0.42 | (0.06) | 6.87 *** |
| Decentering | — | | | — | | | −0.45 | (0.09) | −5.34 *** |
| adjusted $R^2$ | .29 *** | | | .25 *** | | | .36 *** | | |

*Note*. Dep = Depressive symptoms.

***$p < .001$

The results showed that the indirect effect of self-reflection was significantly different from zero at $p < .05$ (point estimate = −0.11; 95% CI [−0.18, −0.06]) and the significant indirect effect of self-rumination (point estimate = 0.15; 95% CI [0.08, 0.24]), suggesting that individuals high in self-reflection show lower depressive symptoms via higher decentering while individuals high in self-rumination show higher depressive symptoms via lower decentering.[12]

## Discussion

The present results largely support my hypotheses. Mediation analysis showed significant indirect association of self-reflection with low levels of depressive symptoms through high decentering. The significant indirect association of self-rumination through low decentering suggests that the maladaptive role of self-rumination is partially mediated by decentering. This result supports the theory that ruminative thinking counteracts decentering, which can reduce depressive symptoms (Campbell et al., 2012; Fresco, Moore et al., 2007). The direct association of self- rumination with depressive symptoms also remained after controlling for the indirect association.

The negative indirect association of self-reflection with depressive symptoms via decentering supports the notion that self-reflection is an adaptive form of self-focus (Trapnell & Campbell, 1999). This result suggests that individuals high in self-reflection can acquire a decentered perspective, and this ability of decentering is a source of the adaptivity of self-reflection. However, the direct associations between self-reflection and depressive symptoms were not significant regardless of whether or not I controlled for decentering. The direct relationship between self-reflection and depression is instable among previous studies. For example, one previous study

[12] The test of homogeneity was marginally significant ($p = .072$). Thus, I decided not to test interactions between decentering and self-reflection or self-rumination, and adopted the result about indirect effects, which is significant at $p < .05$. I also discussed the interaction between self-rumination and decentering in the subsequent discussion section.

reported a negative association between self-reflection and depressive symptoms (Takano & Tanno, 2009b) while others reported non-significant correlation (Siegle, et al., 2004; Trapnell & Campbell, 1999). These mixed results may be because these previous studies did not assess indirect association through decentering. In addition, the prior research indicating the negative association between self-reflection and depressive symptoms (Takano & Tanno, 2009b) also suggested that self-reflective thinking can turn into self-ruminative thinking. One possibility is that self-reflection becomes adaptive only when it leads to increased decentering and maladaptive when it leads to decreased decentering, turning into negative and ruminative thinking. Although I suggested that self-reflection enhances problem solving in Chapter 2, some previous research has suggested that self-reflective thinking turns into self-ruminative thinking when reflective individuals' attempts to understand and analyze their problems fail to generate solutions (Miranda & Nolen-Hoeksema, 2007; Takano & Tanno, 2009b). Thus, it can be speculated that individuals high in self-reflection can spontaneously take a decentered perspective but are unable to maintain it when they completely fail in their problem-solving attempts. If conducting an intervention to encourage self-reflective people to maintain their decentered perspectives in spite of failed problem-solving attempts, self-reflection may exhibit adaptivity even after their failures.

Contrary to self-reflection, self-rumination was indirectly associated with high levels of depressive symptoms through low levels of decentering. This result is consistent with the theoretical notion that self-rumination is antithetical to decentering and that decentering is an important factor for treatment of depression (Fresco, Moore et al., 2007; Teasdale et al., 2002). However, the direct association between self-rumination and depressive symptoms remained after controlling for decentering, which means that self-rumination is also associated with depressive symptoms without reduction of decentering. One possible explanation for this is that other variables not included in the present model mediate the relationship between self-rumination and depressive symptoms. Indeed,

previous researchers indicated that ruminative thinking is associated with reduction in social support (Flynn, Kecmanovic, & Alloy, 2010) and poor problem-solving ability in interpersonal (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999) and academic domains (Lyubomirsky et al., 2003), and that insufficient social support and poor problem-solving ability are considered to increase depressive symptoms (Haaga, Fine, Terrill, Stewart, & Beck, 1995; Nolen-Hoeksema & Davis, 1999). These unconstructive outcomes can be considered to mediate the association between self-rumination and depressive symptoms. Although previous research suggested that problem-solving ability is also associated with decentering, and, thus, impaired problem solving may be partially explained by reduction of decentering (Ostafin & Kassman, 2012), future research needs to examine the mediating role of these unconstructive outcomes associated with rumination. Another possible explanation is that the remaining direct association may have been due to the features of self-rumination other than decentering inability. In the present study, I treated self-rumination as a variable theoretically antithetical to decentering (Fresco, Moore et al., 2007; Teasdale et al., 2002). Hence, I did not estimate the interaction between self-rumination and decentering, assuming that the scores would negatively co-vary. However, self-rumination may have characteristics other than inability to take a decentered perspective. For instance, self-rumination also theoretically involve chronicity, negativity, and invasiveness (Trapnell & Campbell, 1999). Certainly, decentering can contribute to objectively observing ruminative thinking, which is negative, chronic, and invasive, and can reduce the effect of ruminative thinking on depression. Nevertheless, decentering inability and other self- rumination features may independently vary; therefore, such features may have affected depressive symptoms independently from or interacting with decentering. To fully disentangle this possibility, future research must decompose self-rumination into negativity, repetitiveness, invasiveness, and decentering inability and test the effect of each feature on depression.

The present study has some limitations. First, I employed a cross-sectional design. Although I assumed that self-focused attention causes the change in decentering and then measured the level of trait self-focus, which is stable, and level of decentering in "recent events", which is more unstable than level of trait decentering ability, I cannot disentangle such causal relationships with a cross-sectional design. Since the present study assumed a mediation model, future research will require a longitudinal study with a three-wave design or an experimental study. Another limitation is a sampling issue. In the present study, participants were non-clinical under graduate students. This constrains generalizability of my findings. In particular, seriously depressed individuals (e.g., depressed patients) theoretically have difficulty taking a decentered perspective (Teasdale et al., 2002). Therefore, spontaneous decentering and the indirect association of self-reflection on depressive symptoms may not be observable in depressed patients. The results need to be examined in clinical samples and the general population.

### 3.2. Study 5: Longitudinal study on stress-diathesis model of decentering

In Study 4, I reported that self-reflection was positively related with decentering, and self-rumination was related to low decentering. Although I discussed how self-reflection increases decentering while self-rumination reduces it, I cannot conclude such temporal relationships since Study 4 employed a cross-sectional survey. In addition, Study 4 did not assess problem-solving related factors such as problems or negative self-discrepancies. In Study 5, I investigated how self-focus predicts temporal change in decentering using the diathesis-stress model as a framework (Metalsky et al., 1982; Metalsky & Joiner, 1992). The original diathesis-stress framework posits that personal negative life events (i.e., stressors) interact with personal vulnerability in contributing to the increase of depressive symptoms. For example, Metalsky et al. (1982) reported that participants with maladaptive attributional style exacerbated their depressed mood under the existence of a stressor whereas participants without such a style did not exacerbate their depressed mood. In the present model, I hypothesized that decentering is reduced by stressors, and this stressor effect is buffered by self-reflection and amplified by self-rumination.

A stressor can be an indicator of negative self-discrepancy. If there are too many stressors, individuals repeatedly face the negative discrepancies and generally experience disturbed moods such as depressed mood and anxiety. In such circumstances, people tend to ruminate about or lose decentered perspective regarding the stressors themselves and about the negative mood induced by these stressors unless the individuals have some stress tolerance. The association between stressors and reduction of decentering may increase in strength among people vulnerable to stressors, such as self-ruminators. Previous research has suggested that self-rumination amplifies the effect of stressors on depressive symptoms as self-ruminators repeatedly and chronically ruminate about the negative self-discrepancy (Mori & Tanno, 2013; Takano & Tanno, 2009a). Similarly, self-rumination is considered to amplify the negative effect of stressors on decentering by a ruminative

reaction to the discrepancy because this type of reaction consumes the attentional resources required for maintaining a decentered or mindful perspective (Fresco, Moore et al., 2007; Tanaka et al., 2013; Teasdale et al., 2002). On the other hand, self-reflection may maintain a decentered perspective against stressors. Through the studies in Chapter 2, I reported the good problem-solving ability of self-reflectors. In addition, I discussed in Chapter 1 how proper problem solving requires a decentered self-focusing on negative self-discrepancy. Self-regulatory behavior, including problem solving, form a hierarchical feedback loop (Carver & Scheier, 1982, 1990; Figure 1-2 in Chapter 1), and a decentered perspective cultivates the ability to accurately monitor the discrepancy and the entire feedback system, enabling individuals to successfully regulate themselves (Inzliht et al., 2014; Teper et al., 2013) without falling into ruminative thinking, misestimating the magnitude of self-discrepancy, and reducing motivation. Thus, it is hypothesized that self-reflective individuals maintain a high level of decentered perspective on the negative discrepancy when repeatedly facing the discrepancy.

The present study examined these moderating roles of self-reflection and self-rumination in the relationship between stressors and decentering. Furthermore, I also investigated the interaction between self-reflection and self-rumination. To the best of my knowledge, no previous research has reported this interaction. However, because empirical research suggested that self-reflection sometimes co-exists with self-rumination and that this is the reason for the weak adaptivity of self-reflection (Takano & Tanno, 2009b), self-reflection may work best in the absence of self-rumination. Therefore, it is hypothesized that self-reflectors maintain their high-level decentered perspective against many stressors only when self-rumination is low. On the other hand, with high self-rumination and many stressors, self-reflectors cannot maintain their high-level decentering, and the level reduces to a low or moderate level. High self-ruminators with low self-reflection are hypothesized to have low-level decentered perspectives and largely reduce it when they experienced

many stressors. For individuals with low self-reflection and low self-rumination, it is hypothesized that decentering continues approximately constantly at a moderate level (see my result from Study 4) with or without stressors, because they have little tendency toward self-focus and then seldom recognize negative self-discrepancy.

## Method

### Participants and Procedure

Two-hundred and ninety-seven Japanese undergraduate students (202 men, 95 women) agreed to participate in my survey and completed two questionnaire packets in introductory psychology at Japanese universities. Their mean age was 19.1 years ($SD$ = 0.9). The questionnaire packet at the initial assessment (Time 1) contained the measurements for trait self-rumination, trait self-reflection, and baseline decentering. Five weeks later, second assessment (Time 2) was conducted with another questionnaire packet that measured decentering once again in addition to stressors experienced during five weeks.

### Questionnaire

**Self-Rumination, Self-Reflection, and Decentering.** Self-rumination and self-reflection were assessed using the RRQ, and decentering in recent events was assessed using the EQ.

**Stressors.** Stressors are often measured as negative life events (NLE) in the diathesis-stress model (e.g., Takano & Tanno, 2009a). I used the Scale of Life Events in Interpersonal and Achievement Domains (Takahira, 1998) to assess how many stressors participants encountered. This scale consists of 30 descriptions of NLEs, including daily social interactions and achievement-domain activities (e.g., “I was ignored by others” and “I got bad results in exams or reports.”). Participants were asked to indicate whether they experienced each description using a dichotomous scale (0 = *no,* and 1 = *yes*). The score indicates the amount of NLEs. Takahira (1998) developed this

scale for undergraduate students and selected the events whose experience rate ranged from 20 to 80% among participating students. In the present study, I asked participants to answer questions about NLEs during the five weeks between Time 1 and Time 2 assessments. This scale exhibited good internal consistency ($\alpha = .86$).

## Results

Table 3-3 provides descriptive statistics and correlations between the study variables. Self-reflection had a positive association with Time 1 decentering ($r = .20$, $p < .001$). Correlation coefficients between self-reflection and Time 2 decentering were significant, but the magnitude was very small ($r = .13$, $p < .001$). Therefore, it is loosely concluded that self-reflection had an association with Time 2 decentering, based on this correlation analysis. Self-rumination was negatively associated with both Time 1 and Time 2 decentering ($r = -.32$ and $-.24$, respectively, $ps < .001$). Consistently with my hypothesis, Time 2 decentering was negatively associated with NLEs experienced during the assessments interval ($r = -.21$, $p < .001$). However, Time 1 decentering also had a negative association with NLEs ($r = -.22$, $p < .001$). Furthermore, self-rumination also had a positive association with NLEs ($r = .22$, $p < .001$). These imply a possibility that decentering and self-rumination predict subsequent experiences of stressors. This may be because self-ruminators are poor problem solvers (Lyubomirsky et al., 2003), and a decentered perspective contributes to problem solving (Inzliht et al., 2014). I then examined the multiple regression model in which Time 1 decentering and self-rumination predict subsequent NLEs. Although Time 1 decentering positively predicted NLEs, and self-rumination predicted them negatively, the magnitude of the adjusted $R^2$ was very small (.07), and it can be interpreted that NLEs cannot be largely predicted by only decentering and self-rumination.

To test my hypothesis, I estimated the hierarchical multiple regression model in which Time 2 decentering is predicted by Time 1 decentering, self-reflection, self-rumination, NLEs, and two-

**Table 3-3**

*Descriptive statistics and correlations*

| | Variables | *M* | *SD* | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|
| 1. | Time 1 decentering | 29.0 | 5.4 | — | | | |
| 2. | Time 2 decentering | 29.9 | 5.4 | .68*** | — | | |
| 3. | Self-reflection | 38.2 | 8.1 | .20*** | .13* | — | |
| 4. | Self-rumination | 43.1 | 7.8 | -.32*** | -.24*** | .36*** | — |
| 5. | NLE | 11.4 | 6.0 | -.22*** | -.21*** | .05 | .22*** |

*Note*. NLE = Negative life event.

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

way and three-way interactions between self-focus and NLEs (i.e., self-reflection × self-rumination, self-reflection × NLE, self-rumination × NLE, and self-reflection × self-rumination × NLE; Table 3-4). I entered Time 1 decentering at step 1 as a covariate of the independent variable, simple effects of self-reflection, self-rumination, and NLE at step 2, two-way interactions at step 3, and three-way interactions at step 4 into the equation. As a result, at the final step, the simple effect of Time 1 decentering was significant ($\beta = .64$, $t = 13.03$, $p < .001$) whereas self-reflection and self-rumination did not predict Time 2 decentering ($ps > .641$). NLEs marginally predicted Time 2 decentering ($\beta = -.08$, $t = -1.66$, $p = .098$). Inconsistent with my hypothesis, the three-way and two-way interactions that included NLEs had no significant effect ($ps > .350$), but the interaction between self-reflection and self-rumination had a significant effect ($\beta = .10$, $t = 2.16$, $p = .032$) on Time 2 decentering. This significant interaction may be explained by the positive association between self-rumination and NLE. As described above, I hypothesized that NLEs basically reduce decentering by repeatedly facing negative self-discrepancy, and self-reflection buffers the effect of NLEs. However, self-rumination was correlated with subsequent NLEs ($r = .22$) and has a nature of repeatedly facing the discrepancy (Trapnell & Campbell, 1999). In addition, self-rumination measured in this study is a trait factor, and, thus, the range of the object of rumination by self-ruminators may not be restricted within a certain period while each NLE was restricted within the assessment interval. Therefore, the effect of self-rumination may be stronger than that of NLEs during these five weeks[13]. In other words, in the present model, self-rumination may be a better indicator than NLEs of the number of confronting negative self-discrepancies during the survey period. This may be the reason the interaction between self-reflection and self-rumination only just reached significance.

[13] However, the main effect of self-rumination was non-significant. This may be due to the fact that Time 1 decentering was entered into the equation at the same time. Decentering is antithetical to self-rumination. In addition, Time 1 decentering is considered to have a stronger association with Time 2 decentering than Time 1 self-rumination. For these reasons, the predictive power of self-rumination may have not reached significance.

**Table 3-4**

*Hierarchical multiple regression analysis predicting Time 2 decentering from self-focus and negative-life events (NLE)*

| | Step 1 Covariate model | | | | Step 2 Main effect model | | | |
|---|---|---|---|---|---|---|---|---|
| | *B* | (*SE*) | *β* | *t* | *B* | (*SE*) | *β* | *t* |
| Covariate | | | | | | | | |
| Time 1 decentering | 0.68 | (0.04) | .68 | 15.77 *** | 0.66 | (0.05) | .65 | 13.32 *** |
| Main effects | | | | | | | | |
| Self-reflection | | | — | | 0.01 | (0.03) | .01 | 0.22 |
| Self-rumination | | | — | | -0.01 | (0.04) | -.02 | -0.38 |
| NLE | | | — | | -0.06 | (0.04) | -.06 | -1.45 |
| Two-way interactions | | | | | | | | |
| Self-reflection × Self-rumination | | | — | | | | — | |
| Self-reflection × NLE | | | — | | | | — | |
| Self-rumination × NLE | | | — | | | | — | |
| Three-way interaction | | | | | | | | |
| Self-reflection × Self-rumination × NLE | | | — | | | | — | |
| adjusted $R^2$ | .46 *** | | | | .45 *** | | | |
| Incremental $R^2$ | | | | | .00 | | | |

| | Step 3 Two-way interaction model | | | | Step 4 Three-way interaction model | | | |
|---|---|---|---|---|---|---|---|---|
| | *B* | (*SE*) | *β* | *t* | *B* | (*SE*) | *β* | *t* |
| Covariate | | | | | | | | |
| Time 1 decentering | 0.65 | (0.05) | .64 | 13.01 *** | 0.65 | (0.05) | .64 | 13.03 *** |
| Main effects | | | | | | | | |
| Self-reflection | 0.01 | (0.03) | .02 | 0.32 | -0.00 | (0.03) | -.00 | -0.01 |
| Self-rumination | -0.02 | (0.04) | -.02 | -0.48 | -0.02 | (0.04) | -.02 | -0.47 |
| NLE | -0.07 | (0.04) | -.07 | -1.48 | -0.07 | (0.04) | -.08 | -1.66 † |
| Two-way interactions | | | | | | | | |
| Self-reflection × Self-rumination | 0.01 | (0.00) | .10 | 2.09 * | 0.01 | (0.00) | .10 | 2.16 * |
| Self-reflection × NLE | 0.00 | (0.01) | .03 | 0.57 | 0.00 | (0.01) | .02 | 0.49 |
| Self-rumination × NLE | -0.00 | (0.01) | -.04 | -0.92 | -0.00 | (0.01) | -.03 | -0.69 |
| Three-way interaction | | | | | | | | |
| Self-reflection × Self-rumination × NLE | | | — | | 0.00 | (0.00) | .05 | 0.94 |
| adjusted $R^2$ | .46 *** | | | | .46 *** | | | |
| Incremental $R^2$ | .01 † | | | | .00 | | | |

†$p < .10$, *$p < .05$, ***$p < .001$

Here, it can be speculated that self-reflection buffers the effect of self-rumination on Time 2 decentering. To explore the form of significant interaction, I calculated the simple slopes of self-rumination for higher and lower levels (1 *SD* above and below the mean) of self-reflection (Figure 3-2; Aiken & West, 1991; Bauer & Curran, 2005; Cohen, Cohen, West, & Aiken, 2003) using an online tool (Preacher et al., 2006). Simple slopes were marginally significant for lower self-reflection ($B = -.08$, $t = -1.70$, $p = .090$) but not for higher self-reflection ($B = .04$, $t = 0.93$, $p = .351$). I also calculated the region of significance. As a result, simple slopes of self-rumination are significant when self-reflection score is above 79.79 or below 25.75. Maximum and minimum values of self-reflection in this study were 60 and 17, respectively, and its standard deviation was 8.11. Since the upper bound of significance, 79.79, is above the observed maximum value, I cannot discuss this. On the other hand, the lower bound, 25.75, is within the observed range and about $M - 1.54$ *SD* of self-reflection. Together, simple slopes of self-rumination on decentering are negative and significant when self-reflection is below $M - 1.54$ *SD* but not significant in the other cases. It can be interpreted that, when individuals have certain degrees of tendency for self-reflection (i.e., above $M - 1.54$ *SD*), they can maintain their decentered perspective even with high self-rumination. These results partially support my hypothesis that self-reflection contributes to maintaining a decentered perspective against repeatedly facing negative self-discrepancy.

## Discussion

The present results partially support my hypotheses. Although neither self-reflection nor self-rumination moderated the effect of NLEs, self-reflection buffered the negative effect of self-rumination on decentering. At first, NLEs were hypothesized to be indicators of negative self-discrepancy. However, self-rumination is also considered to be an indicator of negative discrepancy, because it is a tendency toward ruminating about the discrepancy (see Trapnell & Campbell, 1999).

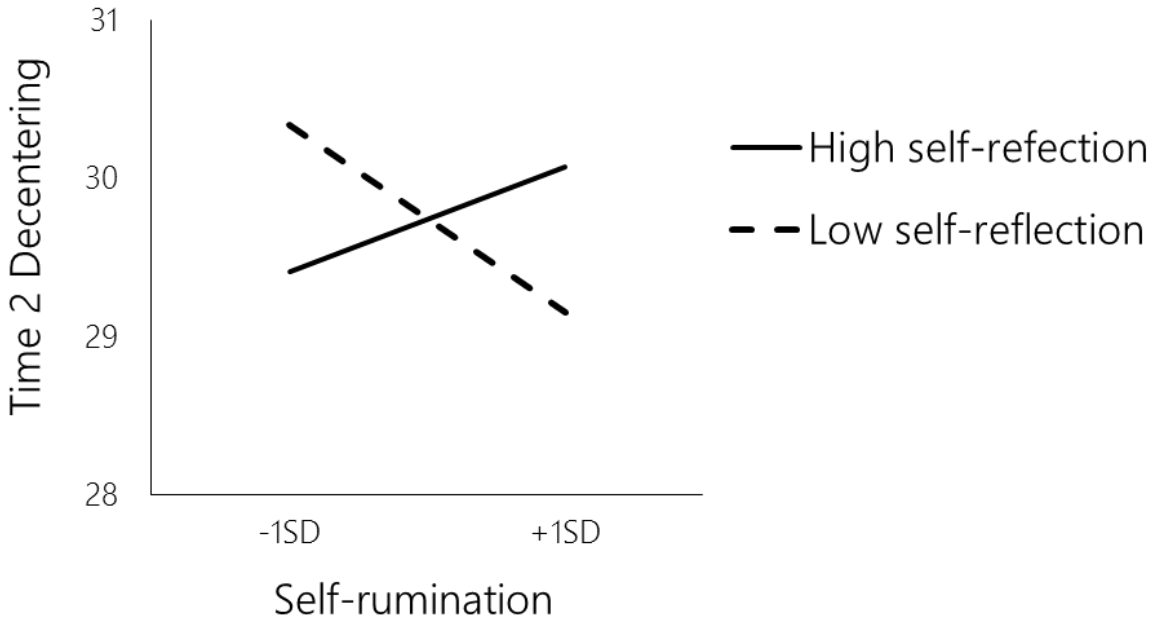


**Figure 3-2.** Conditional associations between predicted decentering and self-rumination for high and low levels of self-reflection.

High self-rumination scores can be interpreted as meaning that individuals repeatedly ruminate about negative self-discrepancy as well as high NLE scores. Therefore, I then hypothesized that the effect of self-rumination is buffered by self-reflection and tested the simple slopes of self-rumination. Tests of simple slopes and region of significance indicated that the negative simple slope of self-rumination is significant only when self-reflection is low (i.e., $M - 1.54\ SD$). This result suggests that self-reflection contributes to maintaining a decentered perspective against repetitive experiences of negative self-discrepancy. Such a feature of self-reflection can enhance problem solving. Analyzing the problem, planning, and implementing a solution are all required to focus on a problem, and such activities easily fall into ruminative thinking or unnecessary distraction if individuals have difficulty maintaining decentering (Inzlicht et al., 2014). The ability of self-reflectors to maintain a decentered perspective can explain the enhanced problem-solving ability among self-reflectors (my results in Chapter 2).

However, the form of this interaction also suggests that high self-reflectors have lower decentered perspectives than low self-reflectors when their self-rumination scores are low. Self-reflection is a subtype of trait self-focus, and, thus, self-reflection also involves a tendency toward repetitively facing negative self-discrepancy. Therefore, in the absence of self-rumination, individuals with high self-reflection may exhibit lower decentering than those with low self-reflection, because high self-reflectors encountered more negative self-discrepancies than do low self-reflectors. Mori and Tanno (2013) have reported a similar pattern of the form of interaction between self-reflection and stressors predicting depressive symptoms, demonstrating that low self-reflectors had lower depressive symptoms than did high self-reflectors under fewer stressors. Nevertheless, there remains ambiguity about why individuals with low self-focus (i.e., low self-reflection and low self-rumination) can exhibit high decentered perspectives. Decentering theoretically involves self-focused attention since it is the ability to objectively and non-

judgmentally observe “internal” experiences (Fresco, Moore et al., 2007; Teasdale et al., 2002), which is inconsistent with the above discussion. A possible explanation for this inconsistency is that, although decentering theoretically involves a self-focus component (e.g., “I can observe unpleasant feelings without being drawn into them.”), the scale of decentering employed in this study includes items whose measured contents do not require deep or high-order self-focus, such as “I can treat myself kindly” and “I view things from a wider perspective.”

Even though I hypothesized that stressors basically reduce decentering, the main effect of NLEs was only marginally significant. There are some possible reasons for this very small effect of NLEs. First, both self-rumination and Time 1 decentering had associations with NLEs. This suggests that these three variables shared predictive powers. Second, as described above, decentering theoretically involves self-focused attention (Fresco, Moore et al., 2007; Teasdale et al., 2002). This implies that self-rumination, which is negative self-focus, had a stronger effect on decentering than NLEs. Third, although I measured NLEs experienced over five weeks, and this can be an index of negative self-discrepancy experienced within the period, self-rumination is measured as a trait factor. Thus, self-rumination can be an index of the broader negative self-discrepancies experienced in a longer span than the survey period, such as past failures or perceived personal deficits experienced in their whole lifetime (Trapnell & Campbell, 1999). Taken together, NLEs might have shared predictive power with self-rumination and Time 1 decentering, and that power might have been smaller than those of self-rumination and Time 1 decentering. Therefore, it is considered that the effect of NLEs was small after controlling for self-rumination and decentering.

Nonetheless, caution is warranted in interpreting my results. First, as in Study 4, the participants were undergraduate students. This constrains the generalizability of previous findings to clinical patients. Second, I measured “stressors” in the present study because, if I measured “stress,” its score might co-vary with study variables. For example, because self-ruminators have a

negative bias (Lyubomirsky et al., 1999), they will report more stress than low self-ruminators in the same situations. However, stress is considered to be a more direct indicator of negative self-discrepancy than is stressors. Measuring stress may enable future researchers to acquire observable interactions between stress and self-reflection. Third, because I measured self-reflection and self-rumination as trait variables, it is unclear whether participants with high self-rumination or self-reflection scores were attentively focusing on themselves during the assessment period. Therefore, as a possible explanation for self-reflection contributing to maintenance of decentering, self-reflectors may have tended to distract rather than decenter from negative self-discrepancies. Distraction is directing attention toward external stimuli to prevent ruminative self-focusing, and it can lift one's feelings (Nolen-Hoeksema et al., 2008). This type of activity does not directly increase decentered perspective, because it theoretically involves no self-focused thinking. However, if self-reflectors engaged in distraction when they encountered highly stressful self-discrepancy but focused on themselves when there is no stressful discrepancy, they would exhibit relatively high scores in the EQ scale, because they did not immerse themselves in negative feelings but did focus on themselves without self-rumination. Similarly, it is unclear whether self-ruminators did, in fact, repeatedly face negative self-discrepancy during the assessment period. Future research should measure state-like self-rumination. In addition, to compare the effects of state-like self-rumination with state-like self-reflection, measurement of self-reflective thinking must be developed. Finally, although self-reflection interacted with self-rumination, its effect size was relatively small ($\beta$ = .10). One possibility is that, as discussed throughout this thesis, self-reflection is a mixed or ambiguous variable. It certainly involves decentered self-focus, but researchers suggest that it sometimes falls into negative ruminative thinking (Miranda & Nolen-Hoeksema, 2007; Takano & Tanno, 2009b). This may be due to the fact that the RRQ incompletely captures adaptive nature of self-reflection. The alpha coefficient for self-reflection is adequately high.

Nevertheless, contents of the self-reflection subscale include many relatively abstract descriptions (e.g., “I love exploring my ‘inner’ self.”). This may lead to the same response to a questionnaire item but with different intentions. The concept of self-reflection must be reconstructed or clearly redefined.

### 3.3. Summary of Chapter 3

In this chapter, I investigated the associations between self-focused attention and decentering to explore the adaptive nature of self-reflection. In Study 4, I hypothesized that decentering is a possible source for the adaptive function of self-reflection and tested the indirect association between self-focused attention and depressive symptoms via decentering. Mediation analysis indicated that self-reflection had a negative indirect association with depressive symptoms via decentering whereas self-rumination had a positive indirect association via decentering in addition to a positive direct association with depressive symptoms. This result suggests that self-reflection is decentered self-focus. However, since Study 1 employed a cross-sectional design, I was not able to refer to temporal or causal relationships.

Therefore, Study 5 employed a two-wave longitudinal survey and diathesis-stress model to take into account the temporal relationships and my previous suggestion that self-reflection contributes to problem solving. Results were inconsistent with my hypothesis stating that self-reflection contributes to maintaining a decentered perspective against many stressors, which is an indicator of negative self-discrepancy. In addition, I found an unexpected significant interaction between self-reflection and self-rumination. Nevertheless, the form of this interaction partially supported my hypothesis. That is, self-reflection contributed to maintaining a decentered perspective against high self-rumination, which is a tendency toward facing negative self-discrepancy.

In sum, Study 4 suggests that self-reflection exhibits its adaptivity through a decentered perspective, and Study 5 provides the detailed relationship between self-reflection and decentering: self-reflection buffers the negative effect of confronting self-discrepancies on decentering.

# Chapter 4: General Discussion

## 4.1. Summary

This thesis had two main purposes. First, I aimed to clarify the adaptive function of self-focused attention by investigating associations between self-focused attention, problem solving, and depressive symptoms. In Study 1, using a cross-sectional survey, I examined indirect associations between depressive symptoms and two subtypes of self-focus—self-reflection and self-rumination—via perceived problem-solving ability. Moderated mediation analysis revealed that self-reflection was indirectly associated with low levels of depressive symptoms via high problem-solving confidence, although this association was moderated by self-rumination. Specifically, self-rumination amplified the negative indirect association between self-reflection and depressive symptoms. Self-rumination appeared to have a complex role in my model in Study 1, and these roles should be disentangled in future research. However, Study 1 successfully captured, at least, the association between self-reflection and high perceived problem-solving ability. Next, to test the relationship between self-reflection and actual problem-solving behavior in daily living, I conducted Study 2, which employed the diary method and investigated the interactions between self-reflection, self-rumination, daily problem solving, and stress intensity of the problem on depressed mood at the end of the day. Multilevel modeling showed that high self-reflectors who attempted to solve the highly stressful problem of the day tended to report lower depressed mood. In contrast, low self-reflectors reported higher depressed mood after trying to solve the highly stressful problem. These results suggest that high self-reflectors are good problem solvers, whereas low self-reflectors are poor problem solvers. In other words, Study 2 suggests that self-reflection facilitates progress of problem-solving behavior, which in turn results in reduced depressed mood. However, while Study 2 measured depressed mood as an outcome of problem-solving behavior, it did not assess actual problem-solving performance or progress of problem-solving behavior. Therefore, in Study 3, I

created an academic problem-solving task to assess objectively and quantitatively the amount of problem-solving behaviors participants engaged in and their performance. The results of this study indicated that high self-reflectors exhibited many and fluctuating patterns of problem-solving behaviors and consequently good problem-solving performance. Although there remains ambiguity about mechanism of how self-reflection leads to increases in these fluctuations in problem-solving behavior or how these fluctuations in turn lead to improved problem-solving performance, the results suggest that high self-reflectors not only have a more active problem-solving style but also can engage in more effective problem-solving behavior that leads to good problem-solving performance.

Integrating the theoretical suggestions and results from Chapter 2, I aimed to further explore the adaptive nature of self-reflection by investigating its relationship with decentering in Chapter 3. Study 4 suggests that self-reflection demonstrates its adaptivity through objective and distanced, or decentered, perspective while self-rumination counteracts this decentering. To investigate the detailed relationship between self-reflection and decentering, Study 5 employed a two-wave longitudinal survey. The results showed that self-reflection buffered the negative effect of self-rumination on decentering. This suggests that self-reflection contributes to maintaining a decentered perspective against repeated experiences of negative self-discrepancy.

## 4.2. Theoretical implications

### 4.2.1. Adaptive function of self-focus: Problem solving and self-reflection

My series of studies indicated that self-reflection is associated with enhanced problem-solving abilities, as shown by assessments of perceived problem-solving confidence (Study 1) and daily problem-solving behaviors and depressed mood (Study 2), and by objective and quantitative measurements of problem-solving behaviors and performance (Study 3). This suggests that self-

reflection is an adaptive type of self-focused attention which contributes to reducing negative self-discrepancy. In contrast, self-rumination is positively associated with depressive symptoms (Study 1, 2, and 4). These findings are consistent with a previous review suggesting that self-focus per se has only modest to moderate associations with depression (Mor & Winquist, 2002). This is because the traditional definition of self-focus (e.g., Ingram, 1990) does not differentiate between adaptive (i.e., reflective) and maladaptive (i.e., ruminative) self-focus, which are differently related to depression. This conflict in relations in turn attenuates the association between self-focus and depression (Trapnell & Campbell, 1999). These results are also consistent with the notion that self-focused attention is necessary for self-regulation (Carver & Sheier, 1982, 1990). That is, the present thesis corroborates that self-focused attention actually functions in the self-regulation model of Carver and Scheier (1982, 1990), suggesting that the importance of monitoring function as Inzlicht et al. (2014) has proposed. In particular, noteworthy findings are that this thesis has revealed the constructive functions of self-reflection in problem-solving behavior, even out of various self-regulatory behaviors. Problem solving can directly eliminate or modify stressors, resulting in negative emotion regulation (Aldao et al., 2010); thus, successful problem solving has a stronger effect on emotion regulation in the long run than does emotion-focused coping such as reappraisal or distraction, which cannot directly eliminate stressors. Hence, this thesis largely supports the adaptivity of self-reflection, suggesting that it contributes to the reduction or prevention of depressive symptoms by facilitating problem-solving progress (Study 2 and 3).

The adaptive role of self-reflection in problem solving can explain why people engage in rumination and why some individuals have positive beliefs about rumination which is the belief that repetitive analytical thinking on personal problems helps in problem solving but, in many cases, leads individuals to unconstructive ruminative thinking resulting in exacerbation of depressive symptoms (Papageorgou & Wells, 2001). Repetitive thoughts can in fact help in problem solving

(Martin & Tesser, 1996), but such thoughts would be part of self-reflection rather than self-rumination. Individuals who have found that self-reflective thinking actually helped to solve a personal problem may develop the belief that repetitive analytical thinking is helpful. At this point, having positive beliefs about repetitive thoughts is a natural thing and not maladaptive. The problem is that self-reflection sometimes becomes dysfunctional and degenerates into ruminative thinking if individuals continue to think about the problem, even after the problem-solving attempts fail (Miranda & Nolen-Hoeksema, 2007; Takano & Tanno, 2009b). In such situations, other coping behaviors may help. For example, seeking social support for instrumental reasons can provide new information or strategic advice (Carver et al., 1989), and temporal distraction can lift people's mood (Nolen-Hoeksema et al., 2008) and give them a fresh look on the problem (Dijksterhuis, 2004). Such coping strategies might prevent individuals from falling into self-rumination and allow individuals again to engage in self-reflective analysis of a problem through providing new information or a new strategy, or through lifting their mood. However, if people have a strong positive belief about repetitive analyzing, they may not be able to alter their response to problematic situations. Instead, they may continue to think about the problem, and fall into unconstructive ruminative self-focusing. Previous researchers have suggested a reason for why individuals continually ruminate. Papageourgiou and Wells (2001) suggested that metacognitive factors such as low confidence in one's problem solving ability repeatedly stimulate feelings of the need to self-analyze to solve the problem. This can be prevented through psychological education, wherein individuals are taught that there are other coping strategies effective for problem solving, even if they seem initially to be unrelated to the problem solving process (e.g., distraction), because such strategies can lead to constructive self-reflective thinking. In summary, self-focused thinking can be both constructive and unconstructive. Thus, when individuals are attempting to solve a problem, it is important for them to engage in self-reflective thinking but to prevent it from becoming self-

rumination, especially when individuals have positive beliefs about rumination (Takano & Tanno, 2010).

#### 4.2.2. Adaptive nature of self-focus: Decentering and self-reflection

To promote self-reflection, one must know what self-reflection is. Considering my findings, original definition, and prior theories, I here re-define the constructive essence of self-reflection: decentered and active self-focused attention aimed at self-analyzing and self-regulation, and motivated by an epistemic interest in the self. In support of this notion, I found that self-reflection maintains a decentered perspective against repeated confrontation with negative self-discrepancies (Study 5). Furthermore, taking a decentered perspective requires attentional function (Inzliht et al., 2014; Teasdale et al., 2002), and a prior study reported an association between self-reflection and executive attention (Kamijou & Yukawa, 2014). Although the precise causal relationship must be examined, it is believed that individuals with high levels of self-reflection are able to maintain decentering through their attentional function (Kamijou & Yukawa, 2014), engage in self-analysis due to a curiosity about the self (Trapnell & Campbell, 1999), and adopt an active style of self-regulation because they are confident in their problem-solving ability (Study 1). In other words, self-reflection is considered to involve a spontaneous decentered perspective and an orientation towards self-analysis and self-regulation. In this way, self-reflection can contribute to clearer self-knowledge (Şimşek et al., 2013; Trapnell & Campbell, 1999) and less depressive symptoms (Takano & Tanno, 2009b) than can self-rumination, which is immersive, chronic, passive, and uncontrollable negative self-focused attention (Takano & Tanno, 2011; Trapnell & Campbell, 1999). Furthermore, in problematic situations, decentered self-analyzing can improve all problem-solving stages (D'Zurilla & Goldfried, 1971). Specifically, it can enhance (a) analyzing and defining the problem by helping one focus on the problematic situation and compare it with past similar

situations; (b) planning and decision making by translating an abstract goal into a concrete and implementable behavior according to one's abilities and other related personal information; (c) implementation solutions by objectively monitoring the magnitude of self-discrepancy and its reduction rate; and (d) evaluation of the implemented problem-solving process through analytical self-focusing. Importantly, if individuals have a self-reflective tendency, they can complete these stages without ruminating. The high problem-solving ability thus obtained can in turn make individuals more active in problem-solving attempts (Study 1).

However, it should be noted that previous findings have suggested that self-reflection sometimes produces an unconstructive outcome—specifically, high self-reflectors may experience more depressive symptoms than low self-reflectors when there are fewer stressors (Mori & Tanno, 2013). A similar result was observed in my study (Study 5). High self-reflectors exhibited lower levels of decentering than did low self-reflectors when their self-rumination tendency was low. My result is possibly because of the self-focusing component of self-reflection. Self-focusing tendency leads to repetitive recognition of negative self-discrepancies, which in turn evokes a negative mood (Duval & Wicklund, 1972). Even though high self-reflectors tend to have a highly decentered perspective (Study 4 and Study 5) and high confidence in reducing the negative self-discrepancy (Study 1), repetitive experiences of such negative self-discrepancies might produce greater negative mood and a less decentered perspective in this group compared to low self-reflectors, who do not have tendency to self-focus (i.e., who are less likely to recognize their negative self-discrepancies). Mori and Tanno (2013) discussed their results in a similar way, stating that high self-reflectors may focus on past failures rather than analyze current personal problems when there are fewer such problems. Focusing on past negative events, which are no longer changeable, possibly results in increased depressive symptoms. Taken together, even though self-reflection leads to decentering, it is possibly unwise to try to promote self-reflection strongly in an absence of current problems.

My results suggest that the motivational factor of self-reflection also sometimes functions adversely. The correlations in Study 3 indicated that high self-reflectors have a self-fulfillment achievement motive. Although this type of motive is considered to facilitate problem-solving behaviors related to self-fulfillment (Horino, 1987), and thus partially contributes to enhancement of the approaching problem-solving style, the result of Study 3 suggests that it reduces problem-solving behavior in competitive situations. However, there are many inevitable problems or tasks in daily living. To cultivate problem-solving ability not only in the self-fulfillment domain but also in socially competitive situations, it would be ineffective to merely promote a self-fulfillment achievement motive in order to acquire a self-reflective self-focus because doing so might result in avoidance of social competition to a maladaptive degree. Although self-reflection can adaptively function in problem solving, it should be carefully considered how and when self-reflection is promoted.

### 4.3. Practical implications

To enhance individuals' problem-solving ability and prevent exacerbation of depressive symptoms, I next discuss how self-reflection, or decentered self-focus, should be acquired. In the previous section, I suggested that decentered self-focusing contributes to problem solving and consequently to reduction of depressive symptoms. However, this notion may sound inconsistent, as discussed in Chapter 1, with the nature of decentering, which is the ability to objectively and non-judgmentally observe one's thoughts and feelings. Problem solving is initiated by judging that negative thoughts, feelings, or the causes of these negative inner experiences must be resolved. Certainly, Inzlicht et al. (2014) proposed that once accepting the negative self-discrepancy contributes to subsequent self-regulatory behavior. Among the features of decentering, this accepting or non-judgmental component possibly contributes to self-regulation by conserving attentional resources (Inzlicht et

al., 2014; Teper et al., 2013). However, looking particularly at enhancement of problem solving, a more effective means may be use of the objective or distanced component of decentering rather than the non-judgmental or accepting component. In order to propose an effective intervention for depression, I employed the concept of decentering in my thesis because decentering is known to contribute to reduction or prevention of depressive symptoms (Fresco, Moore et al., 2007; Fresco, Segal et al., 2007; McCracken et al., 2014). Nevertheless, intervening in problem-solving ability may require distinguishing the objective and distanced components of decentering from the accepting component. Such interventions must also consider the judgmental-way self-focusing. Indeed, recent research has indicated that distanced and active self-analyzing which aims to judge what has gone wrong results in beneficial outcomes such as improved emotion regulation and increased problem-solving behavior in contrast to ruminative self-analyzing (Ayduk & Kross, 2010; Kross, Gard, Deldin, Clifton, & Ayduk, 2012). However, the accepting component of decentering is not unnecessary. An important strategy would be using the components of decentered self-focus and judgmental self-focus for different purposes in accordance with the stage of problem solving. Specifically, when detecting a negative self-discrepancy (i.e., a stressful personal problem), temporal acceptance of the discrepancy is needed to avoid consuming attentional resources through ruminative thinking (Inzlicht et al., 2014; Teper et al., 2013). After initiation of the problem-solving process, adopting an objective or distanced perspective on the discrepancy (Ayduk & Kross, 2010) combined with a judgmental self-focus can enhance the various steps of the problem solving. When individuals are planning, objective and active judgment of which aspects of the problem must be eliminated or modified is required for effective analysis of the problem, concrete planning, and successful decision making. Additionally, when they are implementing the solution, the objective perspective can enhance the monitoring function.

Then, how are the distanced, judgmental, and accepting-ways self-focus promoted? A sure

way of simply promoting decentering without discrimination of its components is mindfulness training (Fresco, Moore et al., 2007; Teasdale et al., 2002). However, although mindfulness can enhance problem solving (Mrazek, Franklin, Phillips, Baird, & Schooler, 2013; Ostafin & Kassma, 2012), it does not explicitly focus on problem solving or changing negative self-discrepancies, but rather on accepting and non-reaction to the self-discrepancy. Mindfulness is a useful way of acquiring a decentered self-focus, but other methods are required to learn self-focusing that incorporates the accepting, distanced, judgmental, and actively self-analytical ways in order to cultivate problem-solving skills that work well throughout all stages of problem solving. In line with this, Kross et al. (2014) proposed a fascinating method of inducing distanced self-analyzing. Specifically, when individuals are focusing on the self, non-first-person pronouns (e.g., why is *she/he* so depressed?) induced distanced self-analyzing whereas first-person pronouns (e.g., why am *I* so depressed?) induced immersive self-focusing (i.e., self-rumination). Kross et al. (2014) suggested that non-first-person pronouns increase the psychological distance from one's self, thereby resulting in a distanced perspective (i.e., self-distancing; Kross, 2009). Self-distancing is typically described as "thinking about oneself from the perspective of a fly on the wall" (Ayduk & Kross, 2010, p809), and it per se does not theoretically involve the intentions of acceptance, non-judgment, or problem solving. In other words, self-distancing is merely a method of taking a neutrally distanced perspective. However, the method of inducing self-distancing is easily applicable to facilitating decentered problem solving. When individuals become aware of their problems, use of non-first-person pronouns (e.g. "*she/he* has failed to pass the exam") and intentionally adopting an accepting manner can help them to once accept the problems. When analyzing the problem and planning, use of non-first-person pronouns and intentionally adopting a judgmental manner (e.g. "what is the matter with *you*?" or "what should *she/he* do to solve this problem?") can possibly lead to more accurate definition of the problem, proper planning, and

generation of effective solutions. Implementing the solution can be enhanced in a similar way, such as by talking to oneself (e.g., "*she/he* should next…" or "aren't *you* tired?"), because this can lead to objective monitoring without rumination. Once the problem-solving attempt has finished, non-first-person self-talk can further contribute to evaluation of the problem-solving process and its results. Such evaluation is important for constructing self-knowledge and would help in future problem solving (D'Zurilla & Goldfried, 1971).

As discussed above, it is unwise to blindly promote self-reflection in the way that I proposed. For example, among the subcomponents of mindfulness, observing one's experiences appears to be correlated with dissociation, which includes the perception of unreality and a lack of perception of inner experiences (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Therefore, if individuals always talk to themselves with non-first person pronouns or adopt a distanced perspective in self-describing, they might exhibit depersonalization-like experiences. Furthermore, although self-focusing can certainly intensify negative mood and increase inner attribution of negative events, it also intensifies positive mood and increases attribution of positive events (Duval & Wicklund, 1972; Scheier & Carver, 1977). Thus, it is considered adaptive to orient one's focus to the self immediately after positive events such as successfully solving a problem. Researchers, however, have suggested that such positive rumination can relate to manic symptoms in bipolar depressive disorder (Johnson, McKenzie, & McMurrich, 2008; Watkins, 2008). Ultimately, the most important strategy is sufficiently balancing self-reflective thinking, self-immersive thinking, and distraction (i.e., focusing on the external environment). Considering these suggestions, future research needs to pursue what constitutes optimal balance and develop an effective preventative method for depressive disorders.

### 4.4. Limitations and future directions

Several caveats are needed when interpreting my findings. First, the participants in my thesis were all undergraduate or graduate students, and I collected no diagnostic information. Although the present findings can contribute to the prevention of increases in non-clinical depressive symptoms, they cannot be applied directly in therapy for depressive disorders. Moreover, self-focusing style is considered to change considerably throughout the stages of adolescence. Recent research on Japanese adolescents (Takasaka, 2009) has reported developmental changes in reflective thinking across the early (i.e. in junior high school), middle (i.e. in high school), and late (i.e., in university) periods of adolescence. Takasaka (2009) pointed out that junior high school students showed less of the conflicting type of reflection, whereas high school students and university students showed more of this type. Furthermore, university students had a deeper style of reflection. Considering the developmental changes in reflective thinking, future research should investigate how adolescents develop trait self-reflection and self-rumination, spontaneous decentering, and positive beliefs about repetitive thinking throughout the stages in adolescence. Furthermore, it should examine whether early cultivation of adaptive self-reflection is possible for the early prevention of depressive disorders.

Second, as a similar sampling issue, the present sample was entirely made up of Japanese students. This also may constrain the generalizability of my findings. Theorists have pointed out that the self–other relationships in Japan differ from those in Western or American cultures (Markus & Kitayama, 1991). In Eastern or Asian cultures, people tend to have an interdependent construal of self, which means that they recognize the self as a participant in a larger social unit, and she/he is motivated to find a way to fit in with relevant others. In contrast, Western or American people have a more independent construal of the self, meaning that they have a conception of the self as an autonomous, independent person (Markus & Kitayama, 1991). The interdependent self-construal is positively associated with social anxiety, while the independent self-construal has a negative

association with the same (Okazaki, 1997). Thus, the association between self-focus and emotion in Japan may differ from that in other countries, so caution should be exercised in applying my results to other cultures.

Finally, self-reflection and self-rumination were assessed entirely via self-report questionnaires and measured as trait variables. This makes it unclear whether high self-reflectors/ruminators in fact engaged in self-reflective/ruminative thinking during the survey period (Study 2 and 5) and laboratory task (Study 3). Developing measurements for state-like self-reflection utilizing my definition would provide a more stringent test of the hypothesis that self-reflection adaptively functions in the problem-solving process. As a general problem of questionnaire studies, self-report methods also make it unclear what the questionnaire assesses. For example, Schooler (2002) pointed out that self-report corresponds to meta-cognition or meta-cognitive monitoring and not to cognition, consciousness, or behavior itself. Although this thesis has revealed that self-reflection and self-rumination related to decentering that involves meta-monitoring (Teasdale et al., 2002), I measured these variables with the self-report questionnaires. These associations have to be replicated with other types of indices such as behaviors. Similarly, validation of my definition for self-reflection would be needed. For example, the monitoring function for negative self-discrepancy is associated with error-related negativities (ERN). Teper and Inzlicht (2013) reported an association between meditation and improved monitoring function as assessed by ERN, and also found that acceptance predicted ERN. If high self-reflectors adopt a decentered perspective, their self-reflection would be associated with ERN. Furthermore, researchers reported different patterns of brain activity between adopting a third-person perspective and adopting a first-person perspective (e.g. Ruby & Decety, 2001; Vogeley et al., 2004). To confirm whether high self-reflectors have the ability to take an objective or distanced perspective, future research should test whether they exhibit brain activity that is similar to the activity exhibited

when adopting a third-person perspective. Such attempts can also contribute to solving above meta-cognition problems with the self-reporting procedure.

### 4.5. Conclusion

These caveats notwithstanding, the present thesis contributes to the literature by providing insight into the adaptivity of self-focused attention. My studies have revealed that individuals with high levels of self-reflection exhibited high problem-solving ability, and that self-reflection contributed to maintaining a decentered perspective against the tendency toward self-rumination. In conclusion, I propose that high self-reflectors can effectively complete the problem-solving process using a highly decentered perspective, which subsequently results in a reduction of depressive symptoms. Furthermore, this decentered way of problem solving can be promoted via combination of existing methods such as mindfulness meditation and self-distancing. Self-focused attention is a fundamental component underlying everyday self-regulation. As such, utilizing adaptive self-focus instead of maladaptive self-focus in everyday living can contribute to the prevention of the onset and aggravation of depressive symptoms. Future attempts aimed at further elucidating the characteristics of self-reflection such as its relation to clinical depression, developmental changes, and related brain activity could directly contribute to developing more effective interventions and preventative treatments of depressive disorders.

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# Correspondence table between studies in the present thesis and my publications

Chapter 2. Study 2:

Mori, M., Takano, K., & Tanno, Y. (2015). Role of self-focus in the relationship between depressed mood and problem solving. *Motivation and Emotion*, 39, 827–838.

Chapter 3. Study 4:

Mori, M., & Tanno, Y. (2015). Mediating Role of Decentering in the Associations between Self-Reflection , Self-Rumination , and Depressive Symptoms. *Psychology*, *6*, 613–621.

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