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The Effects of Mindsets on Depression

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An abstract of
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Abstract

The Effects of Mindsets on Depression
By Adriana S. Miu

Although evidence-based interventions have been developed to treat depression, relapse rates remain high. This suggests a gap in current theories of depression and its treatments. Cognitive theories of depression posit that maladaptive cognitions about stressful events increase the vulnerability for depression. However, these theories have not examined how changeability mindsets, one's beliefs about the potential for change in personal characteristics, would account for depression. Even though mindset interventions have successfully promoted resilience to academic failure, mindsets have not been fully investigated in the etiology of depression or in the promotion of resilience to psychopathology. The present study examined the effects of mindsets on depression and whether mindsets would incrementally predict risk for depression beyond traditional cognitive theories of depression. Stable attributions were further tested as potential mediators for the effects of mindsets on depression. In addition, a double-blind randomized mindset intervention was conducted to reduce depressive symptoms one month post-intervention. In a sample of 107 college freshmen, regression analyses were used to examine these relations. Results showed that mindsets were not significantly associated with depression and did not uniquely predict depression beyond current cognitive theories. The mindset intervention also did not significantly reduce depressive symptoms one month later. However, a change in mindset was associated with a decrease in depressive symptoms one month later, but only for individuals with an external locus of control. These results provide support for a revised model that incorporates mindsets and locus of control into current etiology and treatment of depression. Further research is needed to replicate these findings and to develop new depression interventions incorporating mindsets and locus of control together.

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Overview

Depression is a common severe mental disorder associated with significant impairments for individuals and challenges for society (Kessler, Chiu, Demler, & Walters, 2005; Mathers, Fat, & Boerma, 2008). Although cognitive theories of depression have provided a better understanding and basis for evidence-based treatments, relapse rates remain high (Butler, Chapman, Forman, & Beck, 2006; Forgeard et al., 2011; Hollon, Stewart, & Strunk, 2006; Paykel, 2007; Parker, Roy, & Eyers, 2003; Stice, Shaw, Bohon, Marti, & Rohde, 2009; Vittengl, Clark, Dunn, & Jarrett, 2007). Moreover, factors that promote resilience and positive coping strategies have not been fully integrated into current theories of depression (Karwoski, Garratt, & Ilardi, 2006; Seligman, 2002). One particular resilience factor is changeability mindsets (West et al., 2014; Yeager & Dweck, 2012). Past research has shown that students with a changeability mindset are more resilient to academic setbacks than students with a fixed mindset (Blackwell, Trzesniewski, & Dweck, 2007; Da Fonseca et al., 2008; Hong, Chiu, Dweck, Lin, & Wan, 1999; Nussbaum & Dweck, 2008). Mindsets have been widely applied to improving learning outcomes, but rarely applied to depression or clinical psychopathology. For these reasons, the present research examined the effects of mindsets on depression and compared mindsets with traditional cognitive theories of depression as predictors of depression. A randomized mindset intervention was also conducted to aim at reducing depressive symptoms in college students one month later.

Depression

Major depressive disorder (MDD) is a detrimental psychological disorder characterized by discrete periods of depressed mood and/or loss of interest or pleasure

most of the day, nearly every day, for at least two weeks (APA, 2013). Along with experiencing depressed moods or loss of interest, affected individuals also exhibit at least four of the following symptoms: change in appetite, insomnia/ hypersomnia, psychomotor retardation or restlessness, low energy levels, feelings of worthlessness or guilt, concentration difficulties, and suicidal thoughts (APA, 2013). Because these symptoms persist for an extended period of time, affected individuals' social and occupational functioning are significantly impaired (Dickinson et al., 2008; Egede, 2007).

Unfortunately, MDD is a prevalent psychological disorder that affects a large population. In the United States, the 12-month prevalence rate is estimated to be 7% (Kessler et al., 2003; 2005). Individuals in age range from 18 to 29 are three times more likely to have MDD than individuals 60 years old or older (Kessler et al., 2003). Depression is also more prevalent among females, whose rates are 1.5 to 3 times higher than rates of males (Nolen-Hoeksema, 1987; 1990).

The onset of MDD often coincides with puberty to young adulthood (Kessler et al., 2003), but onset can also occur during childhood or older adulthood (Kessler et al., 2003). During the course of depression, individuals vary in the intensity and frequency of major depressive episodes. Some may have mild symptoms or no symptoms during an extended period of time whereas others may have a major depressive episode every few months. It is not uncommon for individuals to experience additional depressive episodes after the initial major depressive episode (e.g., Alloy et al., 2006), thus making MDD a recurrent and detrimental disorder.

Given its prevalence and recurrent nature, MDD poses significant burdens to depressed individuals and society. It is the leading cause of disability for ages 15-44

(Mathers et al., 2008) and imposes a health cost of approximately $83 billion on society (Greenberg et al., 2003). Specifically, MDD accounts for an estimated 48% of lost productive time in the workplace, primarily due to reduced performance (Stewart, Ricci, Chee, Morganstein, & Lipton, 2013). On an individual basis, MDD is associated with poor quality of life (e.g., Saarni et al., 2007) and serious outcomes such as suicide (Cuijpers & Smit, 2002) and substance abuse (Audrain-McGovern, 2009; Saluja et al., 2004). Therefore, a better understanding of the etiology and treatment for MDD is urgently needed.

The etiology has been attributed to biological, cognitive, and psychosocial factors (Gotlib & Hammen, 2008, for review). Research has not identified deterministic laboratory tests of biomarkers that are consistently valid or reliable in diagnosing depression. However, the following factors have been implicated in depression: heightened reactivity in the hypothalamic-pituitary-adrenal (HPA) axis (Coryell, Young, & Carroll, 2006; Stetler & Miller, 2011); genetic predispositions (Kendler, Gardner, Neale, & Prescott, 2001; Sullivan, Neale, & Kendler, 2000); and abnormalities in neural systems related to emotional processing, reward seeking, and emotion regulation (Liotti & Mayberg, 2001). For example, the heritability of depression is approximately 40-65% (Kendler et al., 2001; McGue & Christensen, 2003) and the next generation's risk of having MDD is two to four times higher than the general population (Sullivan et al., 2000). Social factors, such as adverse childhood experiences or stressful life events, increase individuals' vulnerability for depression (Chapman et al., 2004). Among many psychological factors, cognitive vulnerability, the tendency to think negatively about the self, future, or the world, can further predispose individuals to depression (Beevers, 2005;

Matthews & MacLeod, 2005). These biological, social, or psychological factors may interact or contribute risk to depression together. For instance, children with both a hyperactive amygdala and depressed mothers who model maladaptive cognitions are more likely to become depressed (Goodman & Gotlib, 1999;Gotlib & Joorman, 2010). The present study focused on maladaptive cognitions to stressful events as a major cause for depression.

Based on their crucial role in depression, effective treatments have targeted these maladaptive cognitions (e.g., cognitive behavior therapy (CBT); Churchill et al., 2001). For example, CBT helps depressed individuals identify and challenge maladaptive thoughts. In collaboration with therapists, depressed clients learn to reframe their maladaptive thoughts into more balanced or neutral thoughts, thereby feeling less depressed (Beck, 2011). Although treatments based on cognitive theories have been effective compared to other treatments (Cuijpers, Andersson, Donker, & van Straten, 2011), cognitive-based preventions and treatments still do not effectively prevent or treat individuals with depression. In the general population, preventions only yield a small effect (d = .02; Horowitz & Garber, 2006; Muñoz, Cuijpers, Smit, Barrera, & Leykin, 2010; Parker, Roy, & Eyers, 2003; Stice et al., 2009) and at least 20% of affected individuals do not respond to treatment (Paykel, 2007). The relapse rate of cognitive treatments has been estimated to be 26-40% (Butler et al., 2006; Forgeard et al., 2011; Hollon et al., 2006; Vittengl et al., 2007). This suggests that cognitive treatments may temporarily alleviate depression for some individuals, but others are vulnerable to recurrent depression in the long run. This high relapse rate calls for research on alternative factors that can further inform depression and its treatment, such as mindsets.

Cognitive Theories of Depression

For decades, cognitive theories of depression (Abramson, Seligman, & Teasdale, 1978; Beck, 1976; 2005; 2008; Disner, Beevers, Haigh, & Beck, 2011) have contributed significantly to the conceptualization and treatment of depression, as maladaptive cognitions and attributional styles predict more severe and recurrent depression (Iacoviello, Alloy, Abramson, Whitehouse, & Hogan, 2006). Several cognitive theories of depression have been proposed, the the most prominent of which are the Beck's Cognitive Theory and Seligman's Learned Helplessness Theory. Primarily, these cognitive theories of depression posit that depression stems not only from life stressors, but also from the maladaptive ways individuals think about themselves and their stressful life situations (Abramson et al., 2002). Individuals with cognitive vulnerability are found to interpret stressful events with negative thought patterns (Abramson et al., 1978; Beck, 1976; 2008). For example, when John's colleagues exclude him, he may believe that they will continue to dislike him and that he will never become accepted in his work environment. According to cognitive theories of depression, this belief makes him feel helpless and depressed, and he would consequently gives up on other interactions with his colleagues (Beck, 1976). Another person may not experience depressed mood if he makes alternative attributions, such as "My colleagues were too busy," or "I may socialize better next time at a more casual setting." Therefore, these theories highlight how cognitive vulnerability increases one's likelihood of developing depression beyond simply experiencing stressful life events.

One prominent theory is Beck's cognitive triad theory, which proposes that individuals develop depression because they have negative underlying schemas about the

self, the future, and the world (Beck, 1976; 2008). These negative schemas are thought to originate from adverse childhood events in life, as children develop early explanations for why negative experiences happen to them. As more negative events occur over time, these negative schemas become reinforced and ingrained, such that individuals use these negative schemas to make sense of the causes and reinforcements of general situations. As a result, individuals are biased negatively in the way they encode, organize, and interpret stressful events. These negative schemas then become easily activated and accessible such that negative aspects of general situations are more salient to individuals with negative schemas than others (Gotlib & Joorman, 2010).

Further, in the cognitive triad Beck proposes that negative schemas contribute to negative representations of the self, the world, and the future (Beck, 1976). Individuals tend to blame the *self* for negative events and to over-generalize negative outcomes to their *future* in the *world*. For instance, an individual who is rejected for a job would be more likely to think that he is a failure (self), that he will always have difficulty finding a job (future), and that he will fail at everything in life (world). In addition to these generalized negative representations of the self and the world, there are also biased cognitive errors in how individuals attend to and encode information. Individuals with cognitive vulnerability are more likely to overgeneralize one mistake to other difficulties (overgeneralization), attend only to negative information and filter out positive feedback (selective attention and disqualifying the positive), and take full responsibility for something that is not completely their fault (personalization; Beck, 2005). These biased ways of attending to and interpreting stressful life events in turn make individuals susceptible to feeling helpless and depressed and have been proposed as a major cause for

depression (Beevers, 2005; Matthews & MacLeod, 2005). Therefore, Beck's Cognitive Theory has helped researchers and clinicians understand how some individuals are especially vulnerable to negative life events due to ingrained negative schemas.

Similarly, Seligman's learned helplessness theory (Abramson et al., 1978; Abramson, Metalsky, & Alloy, 1989) also suggests that individuals feel helpless and depressed not just because of negative events, but also because of maladaptive interpretations. The helplessness theory suggests that individuals develop maladaptive attributional styles about events, the tendency to blame oneself for negative events (internal) and to over-generalize negative outcomes to the future (stable) across many areas of life (global), which are similar to the negative representations of the self, world, and future. Both theories emphasize the implications of negative events on one's perceived capability and general outcomes. On the other hand, the helplessness theory emphasizes a generalized belief of helplessness from not being able to control events in the past whereas Beck's theory emphasizes negative representations that stem from early adverse events.

Although cognitive theories of depression have provided a meaningful understanding of the etiology of depression, there are gaps in current cognitive theories of depression given the high relapse rate. It may be possible that another risk or resilience factor could further predict the development of depression. Protective factors that promote resilience, such as a changeability mindset, have not been incorporated into cognitive theories of depression or its treatment (Karwoski et al., 2006; Seligman, 2002). Mindsets may be an effective tool to reduce maladaptive cognitions given that they have

helped students develop positive coping responses after failures (Blackwell et al., 2007; Da Fonseca et al., 2008; Hong et al., 1999; Nussbaum & Dweck, 2008).

Moreover, maladaptive cognitions addressed in cognitive theories of depression are thought to originate from early life stress (e.g., Beck, 1976; Dodge, Coie, & Lynam, 2006; Ingram, 2003). Several longitudinal studies have shown that early cognitive vulnerability and stressful life events interact to predict the onset of depression later (Iacoviello et al., 2006; Mathews et al., 2005). However, cognitive vulnerability due to early stress alone cannot explain why not everyone exposed to early life stress develops cognitive vulnerability and negative schemas. The current cognitive theories may not be complete, as not all individuals experiencing severe early stress develop maladaptive cognitive vulnerability and not all depressed individuals have experienced early life stress (Joiner, 2001). Cognitive theories of depression have focused on rectifying maladaptive thoughts, but more emphasis should be placed on fostering positive thinking and resilience factors (Karwoski et al., 2006; Seligman, 2002).

As an alternative, the present study proposes that a fixed mindset may make individuals more likely to develop cognitive vulnerability and depression, but a changeability mindset can serve as a powerful tool in depression treatments. Individuals may believe that they cannot change who they are to remedy their adverse situations if their own personality traits, particularly traits that lead to maladaptive outcomes, are relatively fixed, As a result, individuals perceive a lack of control over stressful situations and believe they would continue to experience failure or stress despite limited exposure to adverse events. On the other hand, a changeability mindset incorporates a message about the potential for change, which has been shown to be a mechanism to help

individuals stay persistent in spite of obstacles (West et al., 2014; Yeager & Dweck, 2012). Therefore, mindsets may inform depression treatments and help build resilience against depression. Despite the potential role of mindsets, not much is known about their effects on depression. Therefore, the present study explored the effects of mindsets on depression and compared whether mindsets could predict depression beyond the current cognitive theories of depression.

Changeability Mindsets and Learning

Changeability mindsets are a general set of implicit attitudes or beliefs about the potential for change in personal characteristics (Dweck, 1999). There is a continuum of two basic kinds of mindsets, fixed and changeable. Fixed Mindset (FM) individuals believe in having fixed characteristics. These individuals believe that they may try to do things differently, but they cannot change their inherent personal characteristics. In contrast, Changeability Mindset (CM) individuals believe that their characteristics are malleable and improvable with effort and guidance (Dweck, 1999; Dweck & Leggett, 1988). Studies have found that young children develop mindset beliefs from the praises and reinforcements given by parents and teachers (Dweck, 2008; Heyman & Dweck, 1998; Heyman et al., 1992), suggesting that mindsets are formed without necessary exposure to adverse events. Importantly, mindsets are specific to domains and areas, such that individuals may hold a fixed mindset about their capabilities in math but a changeability mindset in social skills or other areas (Good, Aronson, & Harder., 2008; Knee, 1988; Kray & Haselhuhn, 2007; Tamir, John, Srivastava, & Gross, 2007). Similarly, individuals can also hold a changeability mindset about personal traits for themselves but believe others cannot change (FM) (Miu & Yeager, in press; Yeager, Miu,

Powers, & Dweck, 2013;Yeager, Trzesniewski, & Dweck., 2012). Thus, it is important to be specific in assessing and referring to the domain that the mindset belief applies to. The present study focused on personality mindsets, which refer to the characteristic tendency to behave in a certain manner across most situations, not only on personality traits.

Importantly, because individuals use mindsets as a schematic framework to understand the world and the self (Dweck, 1999; Molden & Dweck, 2006), mindsets have predicted behaviors. If individuals perceive that they have unchangeable bad traits that lead to bad outcomes, they may worry that their situation will always be unfavorable. Thus, these implicit mindsets are most salient and potent during setbacks or conflicts when individuals need to evaluate themselves and their characteristics (Trope & Gaunt, 2000; Chun, Spiegel, & Kruglanski, 2003; Molden, Plaks, & Dweck., 2006). Not much is known about the mechanisms of how mindsets affect depression. To suggest and hypothesize about their effects on depression, the literature of mindsets and learning were reviewed here to provide a theoretical understanding of how mindsets influence general behaviors and likewise depression. These studies have generally shown that intelligence mindsets influence how individuals think, feel and behave, as well as influence subsequent learning outcomes (see Figure 1).

Current research suggests that a fixed mindset about intelligence is associated with maladaptive thoughts, particularly when students experience academic setbacks (Ahmavaara & Houston, 2007; Blackwell et al., 2007; Hong et al., 1999; Robins & Pals, 2002). In response to academic challenges, college students who believe in fixed intelligence are more likely to believe “I’m failing because I’m stupid” (Robins & Pals, 2002). In other studies, FM individuals tend to endorse thinking, “I guess I’m not very

smart" and "I'm no good at things like this" (Dweck, 1999, p. 7; Dweck & Leggett, 1988). These attributions blame the self and suggest that nothing can be done to resolve the failure and therefore these FM students will continue to do poorly.

In contrast, CM individuals are more likely to believe that poor achievement is due to their behaviors (i.e. lack of effort), and more importantly they believe they can change their behaviors and devote more effort on the next test (Robins & Pals, 2002). Even if students adhering to both fixed and changeability mindsets internally attribute the poor achievement to themselves, the fixed mindset is associated with maladaptive attributions about poor grades that extend into the future. Taken together, a fixed mindset about intelligence predisposes individuals to think maladaptively in response to setbacks and to predict future failure compared to those with a changeability mindset.

A fixed intelligence mindset is also associated with negative emotions. When FM individuals believe they have fixed bad traits that they can never change, they likely feel helpless and sad about being "trapped" in such situations. Research has shown that FM students tend to endorse feeling negative and helpless compared to CM students, as FM students are more likely to report feeling "ashamed," "distressed," and "upset" about a poor performance (Burhans & Dweck, 1995; Nussbaum & Dweck, 2008; Robins & Pals, 2002). When FM students are asked to compare their scores with students who typically perform better, FM students report feeling "helpless, inadequate, and vulnerable" (Davis, Burnette, Allison, & Stone, 2011). Students with a baseline or experimentally primed fixed mindset report more anxiety (Burns & Isbell, 2007) and worry more about tests (Cury, Da Fonseca, Zahn, & Elliot, 2008) than CM students. These studies suggest that FM individuals are more affected by academic setbacks and experience more negative

feelings and anxiety, and that these negative feelings likely make it difficult for FM students to stay motivated and persist. Over time, FM students' levels of self-esteem tend to decrease compared to those of CM students, even after controlling for baseline self-esteem (Robins & Pals, 2002).

On the other hand, following a poor academic performance, CM students are more likely to feel "inspired," "determined," and "enthusiastic," rather than the feelings of shame reported by FM individuals (Robins & Pals, 2002). Instead of viewing a low performance as a diagnostic sign of lack of intelligence, CM individuals tend to feel positive and inspired that they will become more intelligent as they learn to surmount difficult tasks. As a result, rather than having deflated self-esteem, CM students show increased self-esteem over 4 years compared to FM students (Robins & Pals, 2002). These findings show that mindsets predict divergent emotions depending on whether individuals have a fixed or changeability mindset.

Besides maladaptive thoughts and emotions, FM individuals are more likely to behave maladaptively, such as giving up easily and avoiding difficult situations. To prevent themselves from re-experiencing helplessness, FM individuals typically avoid further challenges that would validate their assumed bad, unchangeable characteristics. Past research in education has shown that FM students tend to become disappointed to the point of "wanting to give up" and disengaging from the task (Robins & Pals, 2002). They are more likely to use avoidant strategies and choose "I would try not to take this subject ever again" or "I would spend less time on this subject from now on" (Blackwell et al., 2007). They also tend to exhibit more self-handicapping behaviors such as procrastination, when compared to CM students (Chen et al., 2008; Howell & Buro,

2009). These studies indicate that FM students are more likely to give up and avoid potential failure if possible. Importantly, they are more likely to reject remedial support that could help them improve. Among students who did poorly, FM students are less likely to enroll in a remedial course compared to CM students (Hong et al., 1999).

In contrast, during setbacks or challenges, CM individuals tend to confront challenges and persist so that they can improve and make the changes they believe they can make. For example, CM individuals are more likely to report wanting to study harder when something is difficult (Robins & Pals, 2002), and this is evident in students who attempt more math questions (Burns & Isbell, 2007) and choose to do more challenging tasks that they had previously failed at (Nussbaum & Dweck, 2008). Upon receiving negative feedback about their performance, CM students tend to choose difficult tasks in which they "might get confused and make mistakes, but might learn something new and useful" (Hong et al., 1999). These findings suggest that FM individuals are less likely to seek help because they believe they cannot change themselves, whereas CM individuals tend to seek help to improve their skills. In a changeability mindset intervention, the treatment group tends to display greater desire to challenge themselves compared to the control group, and teachers in the double-blind study also observed this increased motivation only in the treatment group (Blackwell et al., 2007). Together, mindsets not only influence individuals' interpretations and feelings toward setbacks, but also influence individuals' subsequent behaviors.

Given how a fixed mindset influences thoughts, feelings, and behaviors, FM individuals have also shown lower motivation and worse learning outcomes than CM individuals. In a longitudinal study following students throughout high school, Blackwell

et al. (2007) found that FM students' math grades mostly stayed the same over two years, but CM students' math grades improved, when prior math achievement is controlled for. After the first two years, a changeability mindset intervention was randomly assigned to half of the sample. The control group showed a decline in their math grades whereas the treatment group showed an improvement in their grades (Blackwell et al., 2007). Similarly, college students showed no difference in their baseline SAT math scores, but their grades diverged depending on the kind of beliefs they held (Good et al., 2008). These studies provide evidence that academic achievement can greatly differ depending on mindsets, particularly as the subject becomes more challenging. More importantly, students' academic outcomes can improve if they are taught the changeability mindset, which suggests a promising way to intervene in poor performance situations.

In sum, mindsets have broad influences on thoughts, feelings, behaviors, and outcomes in learning. In the face of setbacks, a fixed mindset is associated with maladaptive thoughts about the self, feelings of shame and helplessness, avoidant behaviors, lower motivation, and lower grades. On the other hand, a changeability mindset is associated with hopeful thoughts about change, determination and hopefulness, persistent and proactive behaviors, higher motivation, and higher academic achievement.

Changeability Mindsets and Depression

The effects of mindsets have not been examined much in clinical depression. Given that mindsets provide a general framework for encoding and interpreting many situations, the present study proposed that the effects of intelligence mindsets on academic outcomes are similar to the effects of personality mindsets on depression.

Individuals can experience setbacks in both domains, such as a low test score or a personal failure. Mindsets about intelligence and personality both influence how events are perceived and interpreted. In response to setbacks, individuals are likely to reflect on themselves and make meaning out of these stressful events. The beliefs about these setbacks further influence their emotions and behaviors, such that individuals may decide either to give up or try harder on the next test or at the next social encounter.

Proposed effects. Based on known effects of mindsets on learning, a fixed personality mindset is expected to be associated with maladaptive attributions, negative feelings, and avoidant behaviors in depression (see Figure 2). FM individuals are more likely to internally attribute setbacks to character flaws (e.g. "I'm a loser" or "I'm incompetent") and believe that they cannot change inherent, negative traits. In contrast, CM individuals will be expected to interpret their current flaws as improvable and be less likely to foresee future failure. Consequently, CM individuals are expected to be more resilient to depression than FM individuals. Next, FM individuals are expected to feel ashamed, distressed, and helpless about setbacks. They may spend more time worrying about future failure and have lower self-esteem. For CM individuals, they are expected to feel determined and inspired to improve their traits. Rather than having a deflated self-esteem after setbacks, their self-esteem may gradually increase as CM individuals take on challenging activities to improve their traits. The fixed personality mindset increases individuals' vulnerability to feeling sad and negative about themselves, thus adding the risk of depression compared to the changeability mindset. Lastly, a fixed mindset is hypothesized to lead to maladaptive behaviors following setbacks. In depression, FM individuals may give up, avoid potential failure, and reject help and treatments even

when needed. As a result, a fixed mindset likely increases the likelihood that individuals will withdraw from activities, a symptom of depression. In contrast, CM individuals are more likely to acknowledge their deficiencies and strive to overcome these deficiencies by changing and persisting through failure, such as learning new social skills or attempting challenging situations again.

As a result, divergent mindsets likely yield divergent depressive outcomes. Because a fixed mindset promotes more maladaptive attributions, negative feelings, and avoidance behaviors, FM individuals are more likely to be vulnerable to depression. CM individuals are instead more resilient to depression because a changeability mindset promotes more adaptive attributions, hopeful feelings, and persistent behaviors. Over time, CM individuals would maintain or even improve their self-esteem as they perceive themselves developing into a better person, making them more resilient to depression. Therefore, the current study aimed to examine mindsets as a risk factor for depression, as FM individuals are expected to have more maladaptive attributions, negative feelings, and avoidant behaviors.

Current findings. Despite the potential implications for depression, very few studies have focused on mindsets and depression. However, there is some, albeit limited, evidence in specific domains suggesting that mindsets and depression are associated. In the academic domain, college students holding a mindset about fixed *intelligence* tend to respond helplessly to a difficult academic task and believe that "I wasn't smart enough to make it" (Zhao & Dweck, unpublished). They found that FM students respond to a low test score like depressed students, which indicates that a fixed mindset may be a risk factor for depression. Similarly, Da Fonseca et al. (2009) found that students with a fixed

intelligence mindset report more depressive symptoms, and this effect was proposed to occur because of FM students' attributions of failures to a fixed, lack of intelligence (Da Fonseca et al., 2009). Both studies suggest that upon encountering a difficult academic task, students who believe in fixed as opposed to changeable intelligence are more vulnerable to giving up and feeling helpless and depressed.

In the social domain, three other studies provide evidence supporting the role of mindsets in depression. These studies proposed that FM individuals are more likely to become depressed because they believe that they will always have difficulties with peers. Rudolph (2010) found that bullied children with a fixed mindset about peer relationships — the belief that peer relationships will not change — are more likely to report depressive symptoms. Yeager et al. (2012) also found that bullied adolescents with a fixed mindset about bullies' personalities report more depressive symptoms. In contrast, a changeability mindset about bullies' personalities is related to prosocial coping, such as confronting bullies in a non-aggressive manner. In a recent intervention that taught students about the potential for change in people and bullies, the clinically-significant level of depressive symptoms 9 months later decreased by nearly 40% (Miu & Yeager, in press). These studies suggest that a fixed mindset about other individuals or social relationships is associated with depressive outcomes, but that this is not true if one has a changeability mindset.

In addition to these studies supporting the role of mindsets in depression, a few other studies have also examined the effects of mindsets on related constructs or general psychopathology. In a recent study, Schroder, Dawood, Yalch, Donnellan, and Moser (2014) developed a new mindset measure of anxiety, the belief about whether one can

change one's anxiety. They found that individuals with a changeability mindset about anxiety tend to have increased cognitive reappraisal and decreased emotional suppression, which are adaptive strategies to cope with anxiety. This suggests that individuals who believe in the potential for change in their anxiety level may be more proactive and that they would take more initiative to learn and adopt positive coping strategies to deal with distressing emotions. Moreover, a fixed mindset about anxiety was found to be associated with symptoms of anxiety, depression, perfectionism, and interpersonal problems (Schroder et al., 2014). However, this study did not find a significant association between other mindset measures (intelligence, emotion, and personality) and emotion coping strategies. Further, it is unclear if the above results are due to general hopelessness because anxiety, interpersonal problems, perfectionism, and depression are often highly correlated (Hewitt et al., 2002; Swearer, Song, Cary, Eagle, & Mickelson, 2001). More research is needed to understand the generalizability of these effects.

Similarly, mindsets about emotions or emotion regulation have also been associated with depression (De Castella et al., 2013; Kappes & Schikowski, 2013; Romero, Master, Paunesku, Dweck, & Gross, 2014; Tamir et al., 2007). For example, Tamir et al., (2007) found that college freshmen who believe that their emotions are fixed tend to perceive less ability to regulate emotions and are less likely to cope with adaptive reappraisals. This indicates that one's mindset about changeability could influence the coping strategies one adopts. Further, students with a fixed mindset about their emotions are also less likely to seek social support from friends, resulting in more depressive symptoms and poorer social adjustments according to both self- and peer-reports (Tamir

et al., 2007). Overall, these findings indicate that FM individuals not only fail to adopt positive coping strategies but also engage in self-handicapping behaviors (e.g., social withdrawal) that would make their situations worse.

In contrast to the domain-specific finding with mindsets about anxiety or emotions, mindset beliefs about personality have been associated with general psychopathology in youth in a meta-analysis by Schleider, Abel, and Weisz (2015). Specifically, Schleider and colleagues found that youths with a fixed mindset are 58% more likely to have severe mental health problems than youths with a changeability mindset (r =.25, p<.001). Due to the small number of studies included, moderator analyses lacked statistical power to further distinguish between internalizing vs. externalizing problems. The psychological disorders examined were significantly different from one another, which raises methodological concerns about the validity in grouping the disorders together. Nevertheless, the meta-analysis suggests that personality mindsets may be a promising venue for treatment and prevention. Overall, the current literature suggests that mindsets may play a role in depression, such that a fixed mindset is associated with feelings of helplessness and depression, whereas a changeability mindset is associated with proactive efforts to improve oneself in negative situations.

Gaps in current literature. Although the limited literature has shown an association between mindsets and depression, the theoretical framework is unclear and based on several assumptions. Current studies do not clearly explain and test how mindsets may be linked to depression. Instead, these studies tangentially suggest that helplessness and depression arise when one believes in having an unchangeable trait and therefore current predicaments extend into the future (stable attributions). Moreover, it is

unclear whether these findings extend to the adult population or to general beliefs about personality, as studies have focused on specific mindsets in youth such as intelligence or bullies' personality. Limiting mindsets to specific domains (e.g., bullies' personality, intelligence, emotions) may not represent the global, negative beliefs in depressed individuals. Past studies have shown that mindsets are domain-specific (e.g., Rydell, Hugenberg, Ray, & Mackie, 2007), which suggests that mindsets about intelligence in the academic domain may not be generalizable to functioning in other domains. Because depression affects multiple domains rather than exclusively academic or social domains, the current study explored the effects of mindsets about one's general personal characteristics.

Similarities and Differences between Mindsets and Cognitive Theories

The above studies suggest that mindsets play a role in depression, but how are mindsets similar or different from the current cognitive theories of depression? Both traditional cognitive theories of depression and mindsets are similar in the following aspects. First, both assert how individuals think and interpret events leads to certain behaviors and emotions. Mindsets emphasize how a belief about the potential for change shapes outcomes (see Dweck, 1999; 2011). Moreover, in both theories, these maladaptive beliefs are especially salient and activated during stressful life events, not simply during daily events (e.g., Beck, 1976; Molden & Dweck, 2006). Thus, they suggest that a cognitive vulnerability interacts with stressful events to increase vulnerability for depression. Not only do both theories focus on interpretation of negative events, these theories are related to the stability of negative outcomes. In cognitive theories of depression, vulnerable individuals are more likely to perceive negative events to persist

in the future (or stable attribution) (see Abramson et al., 1978; Beck, 1976). Similarly with mindsets, a fixed mindset is associated with the belief that the underlying personal characteristic will last in the future and never change (Dweck, 1999; Yeager et al., 2012). Lastly, cognitive theories of depression and mindset theory both emphasize cognitive reappraisal, such that changing or reframing negative thoughts can help individuals cope better. Past treatments and interventions have aimed at modifying both cognitive vulnerability and a fixed mindset, which have shown lasting effects (e.g., Beck, 2011; Blackwell et al., 2007, Craighead, Hart, Craighead, & Ilardi, 2002). Altogether, these properties suggest that cognitive theories of depression and mindsets are similar in nature and predict similar outcomes in depression. That is, mindsets can also contribute to risk for depression in a similar way as cognitive vulnerability.

Nevertheless, mindsets are different from traditional cognitive theories of depression in the following ways, and studying mindsets may further improve current understanding of the etiology and treatments for depression. The most important difference is that two theories emphasize stability of different aspects. In cognitive theories of depression, individuals feel helpless due to the stability or continued course of negative situations and environments (Abramson et al., 1978; Beck, 1976). On the other hand, mindsets emphasize the stability of personal flaws (Dweck, 1999). Changing the self stems more from within an individual person and thus the individual is expected to have more ability to change himself than to change situations that may sometimes be controlled by external forces. If individuals believe that they cannot change themselves or their behaviors, it is unlikely that they perceive their ability to change situations themselves. For example, a student may believe that he can get a better grade by studying

harder or seeking help, but he would feel more helpless if he cannot change how intelligent or how hardworking he is. As a result, because he cannot change his underlying personal characteristics, he would likely believe that he could not change his future outcomes or life situations and thus becomes more vulnerable.

Second, maladaptive thoughts may originate differently according to the two theories. Mindsets can develop early in life independent of life stressors. Through comments such as "you're so smart" or "you're not meant for soccer, try music instead," parents or teachers can promote a fixed mindset by reinforcing the idea of inborn talent or characteristics in young children (Mueller & Dweck, 1998). On the other hand, Beck's cognitive theory posits that negative schemas are developed after experiencing negative stressful events in childhood (Beck, 1976). The different origins suggest that vulnerability for depression may arise from different sources or causes.

Moreover, having a fixed mindset appears more neutral whereas cognitive vulnerability or maladaptive thoughts appear inherently negative (Yeager et al., 2013). A fixed mindset is common, which has been adopted by approximately half of the participants in studies (Dweck, 2011; Yeager et al., 2013), in contrast to the more stigmatizing cognitive errors or vulnerability. Although the fixed mindset and cognitive vulnerability are proposed to lead to negative outcomes such as depression, the seemingly "neutral" mindset belief that people have fixed traits is likely a better target for intervention. Individuals may be more receptive to acknowledging that they have a fixed mindset than cognitive vulnerability, and past research has shown how a one-time, brief mindset intervention can effectively change individuals' mindsets for an extended period

of time (Miu & Yeager, in press; Yeager et al., 2013). Moreover, a changeability mindset offers an opportunity to examine how positive thinking can treat depression.

Potential Contributions of Mindsets to Understanding and Treatment of Depression beyond Cognitive Theories of Depression

Based on the differences between mindsets and traditional cognitive theories of depression, mindsets may be able to predict depression beyond what is known from cognitive vulnerability. Given that mindsets focus on the lack of change or control within a person, whereas cognitive vulnerability focuses on the lack of change in situations, mindsets may capture more of the personal helplessness embodied in depression. Thus the current study explored whether mindsets could further predict depression beyond what cognitive theories of depression can currently predict.

Second, because mindsets do not necessarily originate from early stressors, the present study explored whether mindsets may be a precursor for cognitive vulnerability. Mindsets can develop early in life by influence from parents and teachers prior to stressful life events and probably prior to cognitive vulnerability takes form. Thus, stable attributions may be a potential mechanism for how mindsets affect depression. Children who develop a mindset that they cannot change their personal characteristics may be more likely to adopt and maintain cognitive vulnerability when negative events occur. This may be due to the belief that if individuals cannot change personal characteristics, it might be harder for them to have the personal ability to change situations themselves. They would likely expect current predicaments to continue in the future. For example, John's colleagues exclude him at a social gathering. If John believes that he is excluded because he is not likable and that his personality is fixed, he likely believes that he cannot

change and blames his fixed character, predicting that he will always be excluded (stable attribution). As a result, he would feel helpless and forego social interactions with his colleagues, which increases his risk for depression. In contrast, if John believes that his traits are changeable and improvable, he likely believes that he can change himself and attributes the exclusion to his behaviors, predicting that his colleagues will accept him if he improves his behaviors. He would feel hopeful and try to improve his social skills or initiate conversations with his colleagues. Thus, when individuals perceive their attributes to be fixed, they are also likely to perceive situations to be stable and feel depressed. Therefore, stable attributions may be a mediating mechanism that can account for the effects of mindsets on depression.

Lastly, based on the non-stigmatizing and seemingly "neutral" nature of a fixed mindset and the more positive nature of a changeability mindset, an intervention aimed at changing the fixed mindset to a changeability mindset may be a promising treatment for depression. Rather than labeling maladaptive or dysfunctional thoughts as negative, the term "fixed" is not inherently negative. In this study, a changeability mindset intervention was implemented to reduce depressive symptoms. Numerous mindset studies have conducted interventions that change mindsets by asking participants to read a "scientific" article that presents evidence of malleability through brain plasticity (Chiu, Hong, & Dweck, 1997; Hong et al., 1999; Kray & Haselhuhn, 2007). Other interventions consist of a 6-session long workshop that presents personal anecdotes and "scientific" evidence of malleability, followed by writing exercises to help participants internalize the changeability mindset (Aronson, Fried, & Good, 2002; Blackwell et al., 2007; Good, Aronson, & Inzlicht, 2003). Rather than directly telling participants that individuals can

change, the intervention presented evidence and anecdotes. After participants learn that individuals can change, participants wrote a narrative about the changeability mindset to future students. This writing exercise has been shown to help individuals internalize the intervention message (Aronson, 1999; Walton & Cohen, 2011).

Not only is the mindset intervention easy to implement, past studies have also shown significant improvement in grades and motivation (Blackwell et al., 2007), prosocial response to peer conflicts (Yeager et al., 2012; 2013; Yeager & Miu, 2011; Yeager, Trzesniewski, Tirri, Nokelainen, & Dweck, 2011), and resilience to stereotypes (Aronson, 1999; Good et al., 2008). Moreover, Yeager et al. (2012) conducted the above changeability mindset intervention with high school students along with a coping skills intervention and no-treatment control condition. They found that both the changeability mindset and coping skills interventions equally reduced the negative effect of peer victimization on depressive symptoms, suggesting that the mindset intervention in the current study may also reduce levels of depressive symptoms in college students.

Statement of Problem and Hypotheses

Evidence-based treatments for depression have high relapse rates (Butler et al., 2006; Forgeard et al., 2011; Hollon et al., 2006; Paykel, 2007; Vittengl et al., 2007), leaving many depressed individuals continuing to suffer from the disorder. Therefore, a more complete understanding of the etiology and treatment for depression is needed. Although mindsets have been effective in promoting resilience against academic setbacks in children and adolescents, not much is known about mindsets' effects on depression. Based on the limited research on mindsets and depression, one cannot make firm conclusions about the effects of mindsets on depression because of the lack of a

theoretical framework and the lack of generalization of mindset effects on depression in adult populations. The current study addressed these issues by proposing a theoretical framework that delineates how mindsets influence thoughts, feelings, and behaviors generally and in depression specifically. This study innovatively integrated mindsets, a social psychological construct with the clinical and cognitive model of depression, and further provided a new framework for how a positive changeability mindset can reduce risk for depression. Methodologically, the proposed study tested whether the effects of mindsets on depressive symptoms would extend to personality mindsets in adults. This study explored whether mindsets can further predict depression beyond cognitive theories of depression and a mindset intervention was conducted as a potential treatment for depression. With these goals, this study aimed to provide a better understanding of how mindsets contribute to the risk of depression, with the following hypotheses.

Hypothesis 1: To examine the effects of mindsets on baseline depressive symptoms

First, this study examined the effects of mindsets on symptoms of depression. It is hypothesized that FM individuals would tend to report more depressive symptoms than CM individuals. If as hypothesized, FM individuals, as represented by lower scores on the Implicit Theory Questionnaire (ITQ), would score higher on the Beck Depression Inventory (BDI) than CM individuals, who score higher on the ITQ, and would report fewer depressive symptoms on the BDI. Previous research has shown that FM individuals, who believe that their personality is fixed, tend to blame a setback on their character, feel helpless, and withdraw from future opportunities (e.g., Blackwell et al., 2007; Erdley, Loomis, Cain, & Dumas-Hine, 1997; Hong et al., 1999; Yeager et al.,

2011). These studies provide a basis for why mindsets might be associated with different depression outcomes.

Hypothesis 2: To test if mindsets predict depression beyond cognitive theories

Given the similarities and differences between traditional cognitive theories of depression and mindsets, it is important to compare these two theories and explore whether mindsets contribute above and beyond current cognitive theories in predicting depression. It is hypothesized that mindsets would provide incremental validity in predicting depression beyond what cognitive theories of depression can predict, such that there is a significant change in model variance (R^2) when mindsets are added as a new predictor to an existing regression model of cognitive theories predicting depressive symptoms. This would suggest that mindsets could account for more variances of depression that maladaptive attributions cannot, which would provide support that mindsets can be an additional risk factor in depression.

Hypothesis 3: To explore whether stable attributions mediate the effects of mindsets on depression

The study assessed the underlying mechanisms for the effects of mindsets on depression by exploring *stable attributions* as a potential mediator. Stable attributions are hypothesized to mediate the main effect, such that a fixed mindset increases vulnerability to depression in part due to the likelihood for FM individuals to make stable attributions and that these maladaptive attributions subsequently increase FM individuals' risks for depression. A fixed mindset may increase vulnerability to depression because individuals likely feel helpless about their inability to change, especially if they predict that their failure would extend into the future (Blackwell et al., 2007; Dweck, 1999; Erdley et al.,

1997). In contrast, CM individuals, who believe that their personality is malleable and improvable, may feel bad temporarily but do not foresee future failure and instead feel motivated to try again (Blackwell et al., 2007; Dweck, 1999; Erdley et al., 1997). Thus, a fixed mindset may predispose individuals to making negative stable attributions and these attributions further increase their risk for depression, whereas a changeability mindset encourages individuals to believe in future growth. A statistical meditational analysis was conducted, as outlined in Baron & Kenny (1986), to investigate whether the effect of a fixed mindset on depressive symptoms becomes non-significant or less significant after accounting for stable attributions.

Hypothesis 4: To explore whether the mindset intervention would reduce depressive symptoms one month post-intervention

To further explore mindset as a potential treatment for depression, the current study tested whether a one-time online intervention teaching the changeability mindset would reduce the number of depressive symptoms one month later. Based on the success of past mindset interventions in buffering students from academic setbacks (e.g., Blackwell et al., 2007), it is hypothesized that the intervention would buffer students from general setbacks and decrease depressive symptoms. Specifically, individuals in the intervention condition would endorse significantly fewer BDI depressive symptoms one month later compared to individuals in the control condition. Treated individuals with a baseline fixed mindset would be expected to benefit more from the intervention than treated individuals with a baseline changeability mindset. FM individuals are at greater risk for depression prior to the intervention and the new changeability mindset framework is expected to help them cope with adversity more adaptively.

Post-hoc exploratory analyses would also be conducted if unanticipated findings were found, as effects may be masked or confounded by other variables.

Method

Participants

College freshman participants were recruited from the psychology student research pool at Emory University. A total of 123 participants signed up for a two-part study that involved two separate lab visits, an initial visit (Time 1) and a one-month follow-up (Time 2). All participants read and provided consent at Time 1. The sample was 76% female; most were Caucasian (47%) and Asian-American (36%). Remaining participants were African-American (8%), Hispanic (3%), and Biracial or Other(6%). A majority of the sample was upper or upper-middle class (70%), which suggests that the sample did not have much financial stress in their upbringing (see Table 1). Eleven participants did not complete the one-month follow-up study and four participants were not freshmen and therefore excluded (see Table 2 for baseline differences between dropouts and full sample). Using the *BACON* outlier test on Stata that detects outliers in multivariate data (Billor, Hadi, & Velleman 2000), one participant was considered an outlier with extreme values. Consistent with the BACON test, this observation was found to be an influential observation with a Cook's D value of .176, which is far above the recommended cutoff ($D > 4/(n-k-1) = .034$; Fox, 1997). This yielded a sample of 107 for both Time 1 and Time 2 studies (see flowchart in Figure 3). Moreover, participants with complete data at both time points were invited to participate in a voluntary follow-up three months after the initial visit. A total of 34 participated in the voluntary study at

Time 3. Exclusion criteria for this study were severe mental disorders, such as bipolar disorder and schizophrenia, and none of the participants met the exclusion criteria.

Procedure

Participants were recruited through the Psychology department at Emory University, and students enrolled in introductory psychology courses signed up for the research studies to learn about research design experientially. If interested, they scheduled and participated in two sessions (initial visit and one month follow-up) at the laboratory for three research credits. Prior to study participation, they were informed about the nature of the study and signed a consent form. Participants completed an online survey that measured self-reported mindset beliefs, depressive symptoms, and attributions to hypothetical incidents. Participants were also asked about locus of control. After participants completed baseline questionnaires of mindsets, depression, and attributions, within the same session, they were randomly assigned on Qualtrics (Qualtrics, Provo, UT) to either the changeability mindset intervention or the control condition, as detailed below. At the end of the intervention, participants provided demographic information. One month later, they received an email to remind them about the Time 2 follow-up appointment. At Time 2, they completed a shorter online survey assessing their mindsets, depressive symptoms, and attributions.

Moreover, participants were asked if they would be interested in an optional 3-month follow-up online survey. If they indicated interest with the researcher, it was noted and the researcher emailed them a link to the online survey 3 months after their initial visit. They were asked to complete the survey within one week. At the end of the study, all participants were debriefed and thanked for their participation, whether they

volunteered for the 3-month follow-up or not. The 3-month follow-up survey was identical to the one-month follow-up survey with items that measured self-reported mindsets, depressive symptoms, and attributions.

Intervention. The current intervention was adapted from the intervention on changeability mindset about *bullies' personality* used and described in several previous studies (e.g., Miu & Yeager, in press; Yeager et al., 2013). Rather than emphasizing on bullies' personalities and overt aggression among high school students as in past interventions, the present intervention made the article and situation more relevant to college freshmen by discussing the potential for change in one's own personality and change in rejection or exclusion in college. The average completion time for the intervention was approximately 25 minutes. Research assistants and researchers were blind to condition, as treatment randomization was conducted through Qualtrics.

The intervention taught the changeability mindset about one's own personality by first presenting a personal anecdote and then a scientific article about the potential to change personality. The article presented studies about how behaviors are controlled by the brain and how brain pathways can be changed (Yeager et al., 2012; 2013), as a way to provide a scientific basis for believing in the potential for change. The article emphasized that if participants experience a rejection or failure, the failure is not due to a fixed, personal deficiency on their part. Participants were asked to summarize the article to ensure they were actively reading it. Afterward, participants read testimonials from others (i.e., upperclassmen) who used the changeability mindset when they encountered a setback. Participants were also asked to write a similar narrative to future students

because this narrative exercise has been shown to help participants internalize the intervention material (see Aronson, 1999; Walton & Cohen, 2011).

In contrast, the control group learned about how different brain parts are specialized in different skills and how the brain processes information (see Yeager & Miu, 2011). In this condition, participants read testimonials about how college upperclassmen integrated the article into understanding the new physical environment at Emory (e.g., the occipital lobe controls your vision and eventually it adjusts to the new school environment). Control participants were then asked to write a similar narrative to future students about how the brain adjusts to the new physical environment.

Measures

Mindsets about personality. The Implicit Personality Theory Questionnaire (Self form) was administered to assess mindsets (Erdley & Dweck, 1993; Hong et al., 1999). Participants rated statements such as "Your personality is a part of you that you can't change very much" on a scale of 1 (strongly agree) to 6 (strongly disagree). The four mindset items were averaged for each time point (α_{t1} = .89; α_{t2} = .90; α_{t3} = .82) and higher values correspond to more of a changeability mindset. The total sample tended to have a more fixed mindset of personality (M = 2.71, SD = 1.00).

To further corroborate the validity of self-reported mindsets, an anecdotal measure was adapted from Erdley & Dweck (1993), which measures the belief that people can change using real life descriptions. Participants read brief anecdotes depicting individuals of either positive or negative personality traits at the beginning of college freshman year. Participants rated the likelihood of future changes in the depicted person's personality. A sample anecdote includes "A student is shy in class, and he does not make

any eye-contact with his peers or participate in seminar discussions." Participants were asked about short-term change, "In a few weeks, do you think he/she would be pretty much the same or different?" and long-term change "What will he/she be like in the future?" These items were on an 8-point Likert scale of "Pretty much the same" to "Very different." Two composite measures of mindsets were created, one for short-term change (α_{t1} = .85; α_{t2} = .85; α_{t3} = .77) and another for long-term change (α_{t1} = .74; α_{t2} = .75; α_{t3} = .77). Higher values on these anecdotal mindset measures correspond to a more changeability mindset. The short-term and long-term anecdotal measures of mindsets are positively correlated with the standard measure of mindsets, but the correlations are low (r_{t1} = .14 for short-term change and r_{t1} = .12 for long-term change). Nevertheless, participants generally rated a more fixed mindset on both Dweck's and anecdotal measures (M_{short} = 3.22, SD_{short} = 1.11; M_{long} = 3.96, SD_{long} = .94).

Depressive symptoms. The Beck Depression Inventory-II (BDI-II) was used to assess depressive symptoms (Beck, Steer, & Brown, 1996). The BDI-II consists of 21 items measuring physiological, emotional, and cognitive symptoms of depression on the DSM-IV. Sample items include sadness, with responses ranging from 0 -3 (0 = I do not feel sad; 3 = I am so sad or unhappy that I can't stand it). The BDI-II score was averaged and demonstrated high internal consistency (α_{t1} = .88; α_{t2} = .90; α_{t3} = .92), with higher values corresponding to more severe depression. Many participants reported minimal number of depressive symptoms (M_{T1} = 8.35, SD = 6.89). However, there were a considerable number of participants who reported mild depression (20%) and moderate depression (9%), with a range of 0 to 31. Although this was not a clinical sample, the

above statistics suggest that the present study encompassed an adequate range in depression symptoms.

Attributions. The Attributional Style Questionnaire (ASQ) was given to measure attributions of events' causations (Peterson et al., 1982; Peterson & Villanova, 1988). The ASQ contains 12 hypothetical anecdotes, to which participants assessed internal vs. external attributions on a 7-point Likert scale, "e.g., Is the cause due to something about you or something about other people or circumstances?" Participants were asked, "e.g., In the future when looking for a job, will this cause again be present?" to assess stable vs. unstable attributions. As a measure of global vs. specific attributions, participants were asked, "Is the cause something that just influences looking for a job or does it also influence other areas of your life?" Moreover, participants were asked to write one major perceived cause for the event, which informed how attributions may in part contribute to depression. Although the ASQ's psychometric properties have been well established (α ranging from .72 to .78; Peterson et al., 1982), the internal consistency for the internal, stable, and global was low (α ranging from .41 to .67). For example, stable attributions of negative events had only an acceptable inter-item reliability of .67 (see Table 4 for correlations).

Potential confounds. Covariates included sex, age, socioeconomic status, ethnicity, and grades. Due to the similarity between locus of control (LOC) and mindsets, participants completed the Nowicki-Strickland Internal-External Control Scale (Nowicki & Duke, 1974) to assess their LOC. This 40-item scale asked participants to rate statements about personal control to which participants answered yes or no. A sample item was "Most of the time do you feel you can change what might happen tomorrow by

what you do today?" The items were summed, such that higher values represented a more external locus of control outlook (M = 10.3, SD = 4.34, range of 2 and 22).

Manipulation checks. Participants' written summaries of the intervention condition article sufficiently reflected the content of the intervention article (See appendix). If the intervention successfully taught the changeability mindset to only the treatment group, the change in mindset before and after the intervention would be greater in the intervention group than control group. Although the change in mindset was higher among intervention group, the change was not significantly different from the change in control group ($M_{\text{intervention}}$ = .429, M_{control} = .397, t (105) = -.33, p = .740). Nevertheless, participants in the intervention condition reported a significantly more changeability mindset than participants in the control condition one month after the intervention ($M_{\text{intervention}}$ = 3.04, M_{control} = 2.52, t (105) = -2.76, p = .007; see Table 3).

Data Analyses

To test whether a baseline fixed mindset was associated with depression, a hierarchical multiple regression analysis was conducted. First, baseline depressive symptoms were regressed on mindsets. Second, to examine the incremental validity of mindsets in predicting depression beyond negative stable attributions, mindsets were added to a regression model that already accounted for negative stable attributions and the ΔR^2 would indicate whether the incremental validity was significant. Lastly, the model controlled for potential confounds such as sex, ethnicity, socioeconomic status, and grades. Given the low correlation between the standard and new anecdotal measures of mindsets, the standard Implicit Theories of Personality measure was primarily used to represent mindsets. Supplementary analyses showed that results did not change even

when the anecdotal mindset measure was added as a separate term in the regression. Further, most college students reported few depressive symptoms, so the distribution of depressive symptoms were right skewed. As a result of this normality violation, depression scores were transformed using a square root transformation. After transformation, the distributions of depression scores were normal (see Figure 4a-d).

Second, to explore the underlying mechanism and to examine whether the effect of fixed mindset on depression is in part due to negative stable attributions, a mediational analysis was conducted following the procedures outlined by Baron & Kenny (1986). Depression was first regressed on mindsets (path c), then mindsets were tested to determine whether they significantly predict stable attributions (path a) and whether stable attributions predict depression (path b). Stable attributions were controlled for in the regression of depression on mindsets (path c').

Lastly, to investigate whether the mindset intervention alleviated depressive symptoms, a simple regression was conducted that regressed one-month follow-up depressive symptoms on condition (intervention vs. control). Baseline mindsets, negative stable attributions, as well as other confounds (e.g., locus of control, sex, race, socioeconomic status, GPA) were also controlled for in the regression analyses.

Results

Effects of Mindsets on Depressive Symptoms at Baseline

Due to the right skewed distribution of depressive symptoms, the number of depressive symptoms has been transformed by taking its square root value. All of the following analyses were conducted using the transformed depressive symptom score.

To examine the effects of mindsets on symptoms of depression at baseline, multiple regression analyses were conducted. First, the association between depressive symptoms and mindsets was not significant (b = .06, t = .62, p = .534, β = .05; see Table 5, Model 1). Additionally, the main effects of the anecdotal mindset measures about short-term change (b = -.04, t = -.26, p = .797) or long-term change (b = .10, t = .60, p = .550) were not significantly associated with depressive symptoms. When controlling for other covariates, the effects of mindsets on depressive symptoms were also not significant (see Model 3 in Table 5). Neither the demographic covariates (sex, race, social class) nor grades were significantly associated with depressive symptoms. Only locus of control was a significant predictor of depressive symptom, b = .10, t = 3.54, p = .001, β = .39, consistent with the well-established finding that individuals with an external locus of control tend to be more vulnerable to depression (Abramowitz, 1969; Benassi, Sweeney, & Dufour, 1988; Haley & Strickland, 1977). Overall, the analyses with or without covariates suggest that there is no relationship between mindsets and depressive symptoms at baseline.

Incremental Predictive Validity of Mindsets beyond Stable Attributions

Because stable attributions in cognitive theories of depression and mindset about changeability of personal characteristics both involve the belief about change, the present study compared whether mindsets would improve the ability of the regression model in predicting depression. First, a simple regression analysis reveals a marginally significant trend that negative stable attributions are associated with depressive symptoms, b = .23, t = 1.80, p = .075, β = .16. This model with negative stable attributions in cognitive theories of depression alone can account for 2.5% of the variance of depressive

symptoms ($R^2_{\text{model 1}}$ =.025; see Table 5). Next, mindsets were added to the regression model and did not significantly increase the regression model's ability to predict depression beyond negative stable attributions ($R^2_{\text{model 2}}$ =.028, ΔR^2 =.003, p = .576). The incremental validity of mindsets in predicting depression beyond cognitive theories of depression is minimal (ΔR^2 =.003).

Do Stable Attributions Mediate the Effects of Mindsets on Depression?

The lack of incremental validity of mindsets may be due to a potential mediation by stable attributions. Stable attributions were hypothesized to mediate the effect of mindsets on depression, such that a fixed mindset may contribute risk for depression in part due to maladaptive, stable attributions. In the traditional mediation analyses procedures outlined by Baron & Kenny (1986), there needs to be a significant mindset and depression (X-Y) relationship prior to investigating meditational effect. However, several researchers have argued otherwise. Zhao, Lynch, & Chen (2010) assert that "there need not be a significant zero-order effect of X on Y for a theoretically meaningful mediation analysis" (p. 10) because the direction of the X-Y effect may be opposite of the direction of the meditational effect (known as suppression effect). Other researchers have also suggested that the X-Y effect does not have to be strictly met in some cases (Hayes, 2009; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Rucker, Preacher, Tormala, & Petty, 2011; Shrout & Bolger, 2002; Zhao et al., 2010). For example, using simulation and experimental data, Rucker et al. (2011) found that when there is lack of power or differences in power for detecting the *a x b* vs. *c* paths, an indirect effect for mediation can still be found despite a non-significant total X-Y effect. Therefore, a

complete mediational analysis was conducted to rule out the possibility of suppression or differences in power to detect effects.

Direct effect. The direct effect of mindset on depressive symptoms was not significant, $b = .06$, $t = .57$, $p = .570$, $\beta = .05$ (path *c*; see Figure 5). Although this X-Y effect was not significant, there may still be a meaningful mediation as discussed (Zhao et al., 2010).

Mediation. Negative stable attributions were next examined as a potential mediator for the effects of mindsets on depressive symptoms. A linear regression showed that a fixed mindset did not significantly predict negative stable attributions, $b = .01$, $t = .09$, $p = .931$, $\beta = .01$ (path *a*; see Figure 5). Next, there was a marginally significant association between negative stable attributions and depressive symptoms, $b = .23$, $t = 1.74$, $p = .085$, $\beta = .16$ (path *b*; see Figure 5). This is consistent with past studies showing that maladaptive beliefs increase the risk for depression (Sweeney, Anderson, & Bailey, 1986 for review).

Finally, controlling for negative stable attributions in an ordinary linear regression, there was generally no change in the effects of mindsets on depressive symptoms, $b = .06$, $t = .56$, $p = .576$, $\beta = .05$ (path *c'*; see Figure 5). Further, in a causal mediation analysis developed by Hicks & Tingley (2011), the indirect effect of mindsets on depressive symptoms through negative stable attributions was not significant, .0017 (95% CI [-.039, .048]). In summary, negative stable attributions were not a mediator for the relationship between mindsets and depressive symptoms, although negative stable attributions were a marginally significant predictor for depressive symptoms.

Effect of Mindset Intervention on Depressive Symptoms One Month Post-Intervention

Randomization Check. Randomization of the mindset intervention was effective except for baseline differences in mindsets (see Table 1). There were no significant baseline differences on covariates between participants in intervention and control groups, such as sex (X^2 = 1.96, p =.162), race/ ethnicity (X^2 = 2.53, p =.639), socioeconomic class (X^2 = 5.94, p =.204), grades (t = -1.75, p = .084), and locus of control (t = .84, p = .400). Regarding variables of interest, there were no significant baseline differences in depressive symptoms (t = -.09, p = .932), and stable attributions (t = .40, p = .687), between treatment and control groups, except for baseline mindset beliefs, t = -2.33, p = .022. At baseline prior to the intervention, participants who received the intervention had a more changeability mindset (M = 2.95, SD = 1.07) compared to participants who were randomized to the control condition (M = 2.50, SD = .90). If participants were dichotomized into either FM or CM individuals, there were no significant differences in the mindset categorization (Control 59%; Intervention 41% of FM individuals, X^2 = 2.67, p =.10, see Table 1). Nevertheless, careful interpretations were needed when analyzing and concluding the effects of mindset intervention on depressive symptoms.

Effect of mindset intervention. Although mindsets are not significantly associated with depressive symptoms, does an intervention teaching about changeability mindset reduce depressive symptoms over time? The intervention did not yield a significant difference in post-intervention depressive symptoms between participants in intervention and control groups, b = -.08, t = -.32, p = .748, d = -.06 (see Model 1 in

Table 6). Given that there were baseline differences in mindsets between intervention and control groups, the analysis of mindset intervention on depressive symptoms at Time 2 also controlled for baseline mindsets. However, the effect of intervention on depressive symptoms remained non-significant, b = -.109, t = -.41, p = .685, d = -.08 (see Model 2 in Table 6). In additional analyses controlling for baseline mindsets and negative stable attributions alone or controlling for additional demographic variables, grades, and locus of control, the intervention did not significantly predict a decrease in post-intervention depressive symptoms (see Models 3-4, Table 6). Notably, baseline locus of control was a significant predictor of post-intervention depression, b = .11, t = 3.08, p = .003, d = .67 (Model 4 in Table 6). Consistent with past literature and the significant association found at baseline, there has been a robust association between locus of control and depressive symptoms at baseline and one-month post-intervention.

Despite the null effect of intervention, could the effect of intervention be effective only for participants with a baseline fixed mindset? The treatment condition x baseline mindset interaction effect was not significant, b = -.03, t = -.11, p = .912. This indicates that the intervention was not particularly effective for individuals who could potentially benefit most from the intervention.

In summary, the above analyses show that there was no significant relationship between mindsets and baseline depressive symptoms and that the changeability mindset intervention did not effectively reduce depressive symptoms one month post-intervention. Nevertheless, there was a consistent effect of locus of control on both baseline and post-intervention depressive symptoms, prompting further post-hoc analyses.

Post-Hoc Analyses: Moderation by Locus of Control

Past literature and the above analyses suggest that locus of control plays an important role in depression (Abramowitz, 1969; Benassi et al., 1988; Haley & Strickland, 1977). Theoretically, locus of control and mindsets are closely linked, as individuals with a more external locus of control might be more likely to believe that their own personal traits are fixed because outcomes are outside of their own personal control. Therefore, is it possible that the effects of mindsets on depressive symptoms depend on locus of control?

Given that individuals who have an external locus of control and a fixed mindset about personality may together contribute higher risk to depression at baseline, an interaction analysis was conducted. There was not a significant mindset and locus of control interaction effect on depressive symptoms, both at baseline and one month post-intervention (Baseline: b =.019, t = .63, p = .531, β = .26; Post-intervention: b = -.039, t = -.97, p = .332, β = -.40; see Table 7).

Nevertheless, could locus of control affect how amenable individuals are to changing their mindset? Moreover, how valuable would it be to learn about changeability mindset depending on their locus of control? An additional interaction analysis was conducted examining whether the *change in mindset* from Time 1 and Time 2 would predict Time 2 depressive symptoms, depending on whether individuals had a baseline external or internal locus of control. Because difference score has been proposed to reflect insightful processes and change over time (see Edwards, 2001 for review), a difference of T1 mindset and T2 mindset could indicate how willing or flexible individuals are to seeing things differently. Findings are consistent with the hypothesis

that as individuals learn to adopt a changeability mindset, their depressive symptoms were reduced, but only for a subgroup. This significant effect was only observed among individuals with an external locus of control. There was a significant mindset change x locus of control interaction effect on depressive symptoms at Time 2, b = -.099, t = -3.12, p = .002, β = -.63 (see Model 1 in Table 8, Table 9). Result remained even after controlling for demographic covariates and grades, b = -.090, t = -2.96, p = .004, β = -.58 (see Model 2 in Table 8, Table 9), controlling for international student status, or using a difference score divided by baseline score ((T2 – T1)/ T1).

To further understand this interaction effect, simple effects were estimated among individuals with external and internal locus of control by centering the locus of control variable at ±1 *SD* (see marginal effects in Figure 6). The simple effect of mindset change among external LOC individuals (LOC centered at 1 *SD* above the mean) was significant, b = -.71, t = -3.52, p = .001, β = -.41 (see Table 10). Among individuals who have a baseline external LOC outlook, as they adopt a more changeability mindset over time, their depressive symptoms tended to decrease. In contrast, the effect of mindset change on depressive symptoms was not statistically significant among individuals with an internal LOC when LOC was centered at 1 *SD* below the mean, b = .194, t = 1.00, p = .322, β = -.11 (see Table 10).

However, it may be possible that the direction of mindset change and depression is reversed. Individuals with an external locus of control who are less depressed might be able to see the possibility for change in themselves over time and not vice versa. Additional analyses were conducted to test for reverse causation. Baseline depression significantly predicted mindset change (from T1 to T2) among participants with external

locus of control (b = -.045, t = -3.58, p = .001). However, baseline depression did not predict mindset change in the full sample (b = -.032, t = -.60, p = .548). Further, baseline depression did not significantly predict Time 2 mindset, when moderated by locus of control (b = -.022, t = -1.32, p = .191). There is mixed evidence regarding the direction of effects, but the associations between mindset change, locus of control, and depressive symptoms are supported.

Overall, the post-hoc analyses provide a richer understanding about how mindsets are not directly associated with depression. Instead, for individuals who begin with a belief that they cannot control outcomes, as they begin to believe that they can change their own personal characteristics, their depressive symptoms decrease at Time 2. On the other hand, this effect was not associated with depressive symptoms for individuals who began with an internal LOC.

Discussion

Interpretation of Findings

Recent studies have shown a high relapse rate in depression treatment (Butler et al., 2006; Forgeard et al., 2011; Hollon et al., 2006; Paykel, 2007; Vittengl et al., 2007), and depression treatments using positive or resilience factors are emergent but not yet prevalent (see Seligman, Steen, Park, & Peterson, 2005; Sin & Lyubomirsky, 2009). Meanwhile, numerous studies in social-developmental psychology have found that changeability mindsets can effectively buffer adolescents from academic setbacks (Blackwell et al., 2007; Hong et al., 1999; Robins & Pals, 2002). However, little research has focused on the effects of mindsets on clinical psychopathology. The current study examined whether fixed and changeability mindsets serve as risk or protective factors for

depression and how changeability mindsets can be used to help individuals be resilient against depression. As an exploratory hypothesis, the study further compared mindsets with current cognitive theories of depression by examining mindsets' incremental validity in predicting depressive symptoms after cognitive vulnerability is accounted for. The study also explored whether stable attributions may be an underlying mechanism for the effects of mindsets on depression.

Mindsets and depression. Results did not confirm hypotheses. Mindsets were not associated with baseline depressive symptoms, such that no significant differences in depressive symptoms were found between FM and CM individuals. Similarly, mindsets did not provide incremental validity in predicting depression beyond cognitive theories of depression and stable attributions did not mediate the relationship between mindsets and depression. Overall, this suggests that mindsets either do not have any true association with depression or do not directly increase risk for depression. However, given that there was a significant mindset change and locus of control interaction effect on depressive symptoms, it is likely that mindsets have an indirect effect on depression. The present study could not replicate previous findings, which is likely due to the lack of stress activation, differences in developmental context, or other mechanisms.

First, unlike previous studies, mindsets may not have been salient or activated during this study, even if there were true associations between mindsets and depression. Past studies have found a significant association between a fixed mindset (e.g., intelligence, social relationships, or bullies' relationship) and depression (Da Fonseca et al., 1999; Rudolph, 2010; Yeager et al., 2012; Zhao & Dweck, unpublished). However, compared to past studies, the present study did not introduce stress or elicit responses to

hypothetical setbacks that would activate mindsets more. Even if this study was conducted during college transition when stress was likely, participants' responses were not tied to stressful college adjustments. Because mindsets are most salient when triggered and activated by setbacks (Molden & Dweck, 2006), further studies should incorporate a stress-inducing condition to make mindset beliefs more salient in session.

Another reason for the discrepancy between current and past findings may be due to different developmental contexts. Previous studies have mostly focused on children and adolescents, but the current study focused on young adults. Developmentally, children and adolescents are often dependent on their parents for resources and are less likely to have the ability to change their environments. On the other hand, young adults, especially college freshmen, may have greater financial and social resources to shape their identities in a completely new environment away from their long-time friends or family at home (e.g., Punch et al., 2002). Further, the college environment often offers many new opportunities, such that college freshmen may expect to adapt and change in an environment that encourages growth and change (Webster, Freedman, & Mervin, 1962). Given that college freshmen may already expect change, mindsets measured during college transition may not be as relevant as those measured in young children and adolescents or individuals who have been in the same environment for a long time. It is thus important to consider the saliency of mindsets based on stress and developmental context in future research.

Further, mindsets may operate in an indirect way by increasing risk for the risk factors that predispose individuals to depression. Some studies have found that individuals with a fixed mindset are more likely to bias their attention and reactivity

toward negative information (known as attentional bias; Chiu et al., 1997; Gervey, Chiu, Hong, & Dweck, 1999). For example, Chiu et al. (1997) found that FM individuals are quicker to label others with negative traits and less likely to change their biases or predictions even when presented with counter-evidence. Yeager et al. (2013) also found that individuals with a fixed mindset about bullies are more likely to believe the other individual to be hostile and intentional even in ambiguous social conflicts. These studies provide support that a fixed mindset may predispose individuals to quickly attend to negative information. Theoretically, when one believes that others cannot change, one is more likely to believe that these individuals would always act the same way due to unchanging characteristics and therefore see a single behavior as indicative of fixed personal dispositions.

However, in the present study, mindsets were not associated with negative stable attributions. This does not lend support for the possibility that mindsets are related to depression indirectly by increasing the tendency for negative bias. It is possible that the stable attributions measured on Attributional Style Questionnaire in the present study were not valid, as inter-item consistency was low. Unexpectedly, the attributions measured in the present study did not replicate the well-established effect between attributions and depressive symptoms (e.g., Abramson et al., 1989; 2002; Alloy et al., 2006). Therefore, it is possible that mindsets are associated with risk factors for depression, such as attentional biases and bias toward negativity. Given these mixed results, it is important to replicate the above findings to test whether mindsets may exert an indirect effect on depression through attentional biases.

Mindset intervention and depression. In addition to the lack of direct association between mindsets and depression, the mindset intervention was not effective in reducing depressive symptoms one month post-intervention. This may be due to flaws in the current study design, as participants randomly assigned to the intervention group had a significantly more changeability mindset than the control group at baseline. Despite baseline differences, the intervention group had a greater change in mindset than in the control group one month later, but the change was not significant. Given these limitations, careful interpretations about the effect of intervention are needed. There is no evidence that mindset intervention effectively reduced depressive symptoms one month later, even after accounting for baseline mindset differences between groups. Interventions in past studies have been more successful than the current study. This is likely due to the more intensive and frequent nature of intervention (e.g., 6-month workshop or multiple sessions in Aronson et al., 2002; Blackwell et al., 2007; Good et al., 2003; Heslin & Vandewalle, 2008) compared to the one-time 30-minute intervention in the present study or in the study by Miu & Yeager (in press). Moreover, past studies have measured outcomes over a longer period of time, such as 6 months or 9 months (Miu & Yeager, in press, Yeager et al., 2012; 2013). Challenging pre-existing beliefs may require a longer period of time to bear fruit, as individuals need to be confronted with real-world situations that either confirm or disconfirm their beliefs (Beck, 1976; 2011; Sherbourne et al., 2001). Thus, the one-month follow-up post-intervention may have been too short to observe changes in depressive symptoms.

Overall, the above results indicate that mindsets do not directly influence depression. Mindsets were not significant risk or protective factors and the intervention

was not effective in reducing depressive symptoms over one month. However, further research is needed to replicate these null findings. Therefore, the study further conducted exploratory analyses to examine if there was an indirect role of mindsets on depression.

Post-hoc findings. Change in mindset over one month was found to be associated with a decrease in depressive symptoms, but only among individuals who held a baseline external locus of control belief. This suggests that changing mindset is more beneficial for individuals who have a general belief that outcomes are controlled by external forces (external locus of control) rather than for individuals who believe that they have personal control over outcomes (internal locus of control; Nowicki & Duke, 1974). This differential outcome suggests that mindset is less relevant to individuals with an internal LOC, who already believe that they can change and control their own destiny or outcomes. On the other hand, adopting a changeability mindset is powerful to individuals with an external LOC. Although external LOC has been a strong predictor of depression (Abramowitz, 1969; Benassi et al., 1988; Haley & Strickland, 1977), the risk of having an external LOC is significantly lower when individuals learn to believe that they have the potential for change in themselves. This suggests that a more changeability mindset may sever or reduce the maladaptive effect of locus of control on depression.

Nevertheless, further research is needed to clarify the following factors in order to conclude the above effect. First, it is important to account for how individuals naturally change their mindsets. In this study, the control group changed its mindset despite not learning about the mindset in an explicit intervention. Consistent with the developmental changes during college, students may have learned about the malleability of their personal characteristics during the first semester of college. Because students are in a new

environment away from their families and upbringing, students may change their mindset by realizing that a new environment often brings a potential for change. Therefore, it highlights the need to identify how mindsets change naturally in future research.

Second, the direction of the effect of mindset change on depression may be reversed. In post-hoc analyses, there was mixed evidence for reverse causality between mindset change and depression. Specifically, results showed that having less baseline depressive symptoms and an external locus of control predicted the ability to develop a more changeability mindset. However, baseline depression and an external locus of control together did not predict Time 2 mindset. Given these mixed results, the current study cannot clearly indicate the directionality of effects. It may be possible that the effects are bidirectional, such that mindset change can help reduce depressive symptoms whereas becoming less depressed can simultaneously help individuals see the possibility for change more easily. Past research provides some evidence that changing mindsets can lead to changes in symptoms in the long term. After learning about the changeability mindset, students' depressive symptoms decreased over time in the intervention group but not in the control group (e.g., Miu & Yeager, in press; Yeager et al., 2012). This suggests that a change in mindsets could induce changes in psychopathology later, such that changing mindsets can help alleviate depression later.

Implications

This study has several implications. The lack of direct association between mindsets and depression does not provide support for the idea that mindsets are risk or protective factors, at least not directly. It also does not support the theoretical model proposed initially about how a fixed mindset leads to behavioral, emotional, and

cognitive changes that subsequently lead to more depressive outcomes. However, given that a significant association between mindset change and a decrease in depressive symptoms was found among external LOC individuals, there was likely an indirect effect of mindsets on depression. These results suggest a few possible theoretical implications for etiology and treatments for depression.

First, this study suggests a conceptual distinction between locus of control and mindsets. Locus of control and mindsets may appear identical because both LOC and mindsets concern whether one can intervene in an event through change or control (Dweck, 1999; Rotter, 1982). However, these two constructs are not necessarily interchangeable. If one believes in having personal control over events but that one's traits are relatively unchangeable, one may believe it takes too much effort to change one's traits and one's overall situation. This may result in feelings of helplessness even if one has an internal locus of control. For example, if Peter believes that he can put more effort into studying to improve his grades (internal LOC) but believes that he is always lazy, he is likely to feel helpless. On the other hand, it is also possible that he perceives a lack of control over events (e.g., getting rejected by peers in a college dormitory), but he can change his attributes (e.g., become more accepted by socializing more) so that he does not necessarily become depressed. The current finding supports this theoretical distinction. If mindsets and locus of control were measuring the same construct, there would not be different depression outcomes for external LOC individuals depending on mindset change. Instead, the different outcomes based on mindset change suggest that a fixed mindset can exacerbate depression but a changeability mindset may in fact buffer individuals from the detrimental risk of an external LOC on depression. To further

understand how mindsets and locus of control may be related, future research should focus on how mindsets and LOC change over time and also explore mindsets about external situations beyond one's self personality. This would better inform how beliefs about controllability of internal and external both predict depression.

More importantly, the finding that mindset change and locus of control together predict depressive symptoms indicates the need for a modified theoretical model (see Figure 7). In the modified theoretical model, locus of control has been added to indicate how only the group with external LOC and a fixed mindset would be most vulnerable to depression. In particular, FM individuals with an external LOC are more likely to give up on any behavioral changes or improvements, feel helpless, and become depressed. On the other hand, CM individuals with an external LOC likely still exert some behavioral changes or improvement, have some personal efficacy, and do not become as depressed as the external LOC and FM group. Regarding individuals with internal LOC, mindsets are not expected to affect depressive outcomes as much due to an overall belief in personal control over situations (see Modified Theoretical Model in Figure 7).

Additionally, the present result provides further support for Rotter's Social Learning Theory about expectancy and the distinctions between generalized vs. specific expectancies (Rotter, 1954; 1960; 1982). In his theory, Rotter proposes that "a reinforcement acts to strengthen an expectancy that a particular behavior or event will be followed by that reinforcement in the future" (Rotter, 1982, p.172). This theory suggests that individuals expect certain outcomes based on previous reinforcements. Rotter further asserted that there are individual differences in locus of control, the *generalized expectancy* of how much individuals believe reinforcements are due to oneself or to

external factors. Compared to internal LOC individuals, the effect of any reinforcement on external LOC individuals is less strong because they see outcomes as contingent on outside forces rather than themselves (Rotter, 1982). However, when outcomes and reinforcements are clearly labeled as determined by a specific factor such as skill (known as *specific expectancies*), the generalized expectancy of locus of control can have less effect (Rotter, 1982, p.173). Consistent with the Social Learning Theory and the interplay of generalized and specific expectancies, the changeability mindset created a specific expectancy that personal characteristics can be determined by individuals themselves. The changeability mindset refers to a more specific expectancy about one's personality, a specific domain, rather than the generalized expectancy about all outcomes for individuals. As a result, mindsets provide specific evidence to counter individuals' general maladaptive belief about the lack of control over situations (external locus of control). After realizing that individuals can specifically change their personal characteristics, individuals who previously believed that they cannot change their outcomes might feel less helpless because at least they can change something more specific – their personal characteristics. Over time, the belief that they can change themselves may slowly help individuals build self-competence. In the current study, the finding supports the idea that incorporating a specific expectancy that individuals can change personal characteristics can weaken the maladaptive effect of the generalized expectancy (LOC) on depression. Thus, mindsets can potentially plant the seed for challenging the maladaptive external LOC belief.

The present study also has practical implications for treatment. Given this study's findings, there are implications for treatment seeking, progress, and target population.

Because FM individuals with an external LOC have a general belief of helplessness, this may affect whether they seek treatment. They may believe that it is futile to do anything or seek treatment when they cannot change their situations and themselves. Past mindset research has shown that FM individuals are afraid to show signs of efforts or needing help, as they interpret effort as a sign of struggle and lack of ability (e.g., Dweck & Leggett, 1988; Hong et al., 1999). Thus, it is important to identify these underlying maladaptive beliefs even in the general population before they seek treatments.

During treatments, a fixed mindset and an external LOC may interfere with treatment progress, but therapists can teach a changeability mindset to reverse its effect. Because FM and external LOC individuals believe that their personality cannot change and outcomes are out of their control, they may be reluctant to adhere to treatment or follow through with therapy homework that requires change. Experiences of relapse or setbacks may cause FM individuals with an external LOC to reinforce their maladaptive beliefs that they are fixed, thereby leading them to give up more easily. Instead, treatments that incorporate a message about changeability mindset may help provide a specific expectancy or evidence that their general maladaptive beliefs are not completely true. If unexamined, both a fixed mindset and external LOC likely deter efforts in therapy, especially because treatments often require trials and errors before reaching full recovery.

In addition to using mindsets in treatment, this study highlights the importance of a target population that would benefit most from depression treatments. For example, given that FM and external LOC individuals are most vulnerable, a mindset intervention should target external LOC individuals. The specific message about changeability

mindset could give them a venue to test out their general belief about lack of control. In contrast, teaching mindsets may not be as helpful to individuals with internal LOC because they already believe in initiating efforts and seeking help, which protects them from depression. Given these individual differences in LOC, findings highlight the importance for future interventions to distinguish between groups of different general beliefs, such as LOC.

Limitations and Strengths

This study has several theoretical and methodological limitations. First, it is unclear what are the underlying mechanisms for how mindset changed independent of the mindset intervention. Because mindset change was associated with a decrease in depressive symptoms for external LOC individuals, it is important to understand how this protective factor was increasingly promoted and adopted by students over time. Past studies have posited that mindset can be promoted based on whether parents and teachers emphasize inborn talents or efforts and processes (Dweck, 2008; Heyman & Dweck, 1998; Heyman et al., 1992; Mueller & Dweck, 1998). This suggests that mindsets are schema that can be shaped by environmental reinforcements and contexts. Mindsets can also be changed through direct interventions that teach individuals about the potential for change (Aronson et al., 2002; Blackwell et al., 2007; Chiu et al., 1997; Good et al., 2003; Hong et al., 1999; Kray & Haselhuhn, 2007). Thus, future research can further compare and contrast the effects of changing mindsets through direct conventional interventions or in natural settings such as college or a work place.

It was also unclear whether this change in mindset would generalize to other populations or contexts. One important future direction for research is to understand who

are more amenable for change or mindset intervention. This study examined individuals with baseline internal vs. external locus of control, as well as differences between sex or ethnic groups. However, this study did not examine whether other contextual factors could influence how "teachable" certain populations are. For example, the mindset intervention has been effective in children and adolescents, but it is unclear about its effect on a wider range of populations, especially in older individuals who may view things as more fixed and stable (e.g., Plaks et al., 2013). Future research could expand to studying different age ranges (e.g., adults post-college or elderly). Studies may also examine the effect of mindset intervention on individuals with few vs. abundant resources, authoritative vs. authoritarian parenting style, or those during transition vs. those who have adjusted in an environment for several years. The present finding may be accounted by the natural changes in college freshmen, who began college feeling helpless and overwhelmed but developed a more changeability mindset after performing well on midterm exams. Thus, it would be important to examine population effects.

As discussed, there was mixed evidence regarding the direction of effect between mindset change and depressive symptoms. Therefore, a longitudinal design over a long period of time may inform developmental processes and how maladaptive thoughts are reinforced over time. This would also provide more insightful understanding of how mindsets change occurs and whether mindsets can be used to treat depression.

There are also methodological limitations in the present study. First, there happened to be significant baseline condition differences, by chance in randomization, such that the intervention group had a more changeability mindset than the control group at the beginning. When the intervention group learned about mindsets, the intervention

might have simply reinforced their pre-existing beliefs. Future studies should ensure that there are an equal number of participants in both treatment and control groups that represent similar baseline levels of mindsets by matching participants based on mindsets.

Moreover, due to the limited scope and time frame of the current research, longitudinal symptoms were assessed one month post-intervention. Because mindsets are social-cognitive theories (Olson & Dweck, 2008) and changing underlying thoughts takes time for individuals to internalize fully, the intervention effect may not have shown or taken effect within a month. Instead, future research should examine its effect over a longer period of time. By extending the timeline, researchers could also ensure that the effects of mindsets on depressive symptoms are long-lasting and not just observed due to natural remission of symptoms between depressive episodes.

Lastly, the current study relied on self-report of symptoms and beliefs, which may not be entirely accurate. Therefore, future studies should employ multi-rater approach, behavioral tasks, and clinician rating of symptoms. For example, peer- or parental-reports would be helpful in accurately reporting often stigmatizing symptoms. An attention bias task may also be better at assessing more implicit cognitive processes or negative biases better than a self-report measure.

Despite these limitations, the present study has several strengths. First, to the best of my knowledge, this is the first study to compare how mindsets, maladaptive thoughts, and locus of control uniquely contribute to risk for depression. Previous studies have made theoretical assumptions about mindsets, but without a clear empirical test as to how mindsets may overlap or differ from extant constructs such as stable attributions and locus of control. To help understand the theoretical underpinning and relationship

between mindsets and stable attributions, the current study examined mindsets' incremental validity of predicting depression beyond maladaptive attributions and whether stable attributions mediated the effect of mindsets on depression.

This study also uniquely applied a social psychological construct to clinical psychopathology and incorporated a protective factor from social psychology (i.e., changeability mindset) as part of depression treatment. Previously, research has emphasized on identifying risk factors, such as maladaptive thoughts, rumination, and stress, but did not comprehensively examine much about how individuals can be resilient against stressors. Therefore, by implanting a positive yet realistic message that individuals have the potential for change, this study tried to build on depression treatments that focus on positive psychology and resilience (Karwoski et al., 2006; Seligman, 2002). The results suggest a promising mechanism that by possessing a more changeability mindset, one can be more resilient against depression despite having the general belief that one does not have control over outcomes.

Methodologically, this study broadened the domain of mindset to be about general personal characteristics, rather than specifically about intelligence, bullies, etc. Not everyone defines himself in terms of only intelligence or only social relationship. Instead, individuals tend to define and assess themselves by reflecting on their whole character and personality. The generalization of mindset in the present study thus allowed for a more holistic view of personal characteristics.

Conclusion

The present study investigated the effects of a fixed vs. changeability mindset on depressive symptoms in young adults as well as contrasted mindsets with cognitive

vulnerability in traditional cognitive theories of depression. A double-blind random assignment to mindset intervention was conducted as a potential intervention for depression. Results suggest that as individuals endorse a more changeability mindset over time, their depressive symptoms tend to decrease, but only for individuals who believed that outcomes and situations were controlled by outside factors. Thus, this study supports an updated model that delineates how locus of control and mindsets together increase vulnerability for depression. This study also provides an alternative, amenable belief that can mitigate the detrimental risk of external locus of control on depression. Future studies should further investigate how changeability mindsets and locus of control could help reduce the intractability and relapse of depression. More research is needed to replicate these findings and to identify underlying mechanisms for changes in mindset as a way to improve resilience against life stressors and setbacks. By having a more complete understanding of the etiology of depression, researchers can better alleviate the recurrent and impairing symptoms of depression.

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Appendix

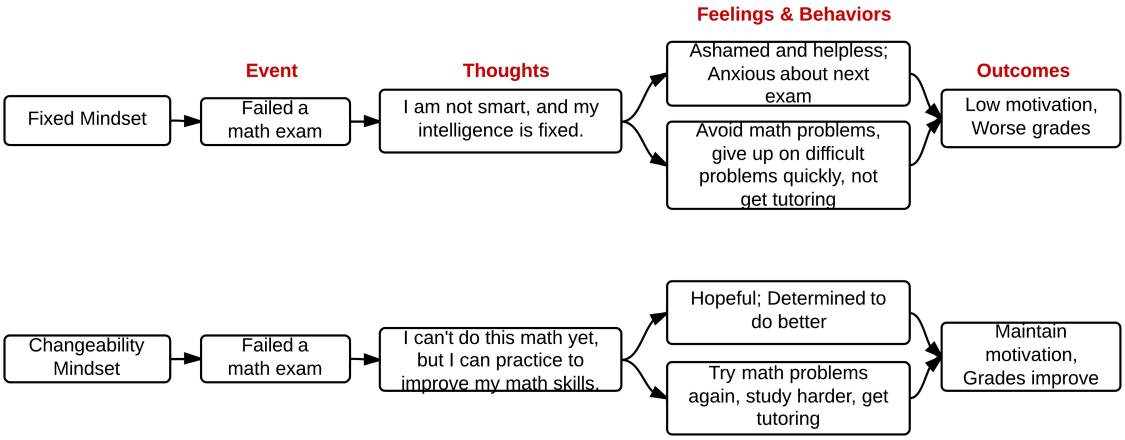


Figure 1. Known effects of mindsets on learning. This theoretical model is based on current literature on mindsets and learning.

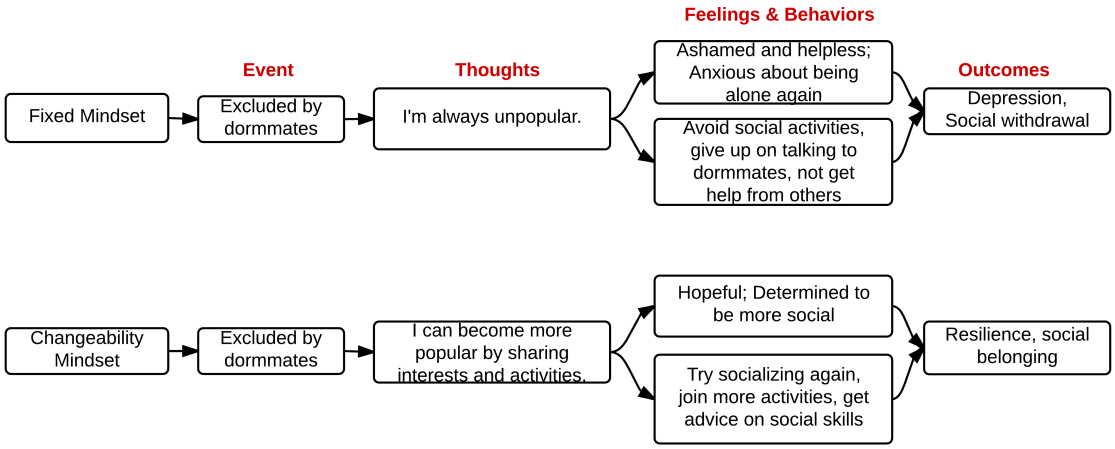


Figure 2. Proposed effects of mindsets on depression.

Table 1

Baseline Sample Characteristics for Intervention and Control Groups

Pre-intervention variable	Control *n (%)/ M*	Intervention *n (%)/ M*	Test statistic	*p* =	Full Sample *n (%)/ M*
Sex			$\chi 2(1) = 1.96$	.16	
Female	47 (58%)	34(42%)			81 (76%)
Male	11(42%)	15(58%)			26 (24%)
Ethnicity			$\chi 2(4) = 2.53$	.64	
Caucasian	24(48%)	26(52%)			50(47%)
African-American	4(44%)	5(56%)			9 (8%)
Hispanic	2(67%)	1(33%)			3(3%)
Asian	24(62%)	15(38%)			39 (36%)
Biracial/ Other	4(67%)	2(33%)			6 (6%)
Socioeconomic class			$\chi 2(4) = 5.94$	.20	
Low	2(40%)	3(60%)			5(5%)
Low-Middle	2(25%)	6(75%)			8(8%)
Middle	8(42%)	11(58%)			19(18%)
Upper-Middle	32(63%)	19(37%)			51 (48%)
Upper	14(58%)	10(46%)			24 (22%)
Fixed Mindset (categorical)	59%	41%	$\chi 2(1) = 2.67$	.10	74 (70%)
Mindset	2.50	2.95	$t(105) = -2.33$	.02*	2.71
Locus of Control	11.1	10.4	$t(120) = .84$	.40	10.3
Depressive Symptom	8.29	8.41	$t(105) = -.09$	.93	8.35
Stable Attributions-Neg	4.34	4.28	$t(105) = .40$	.69	4.31
N	58	49			107

Notes: *<.05; **<.01; ***<.001. Individuals were categorized as a fixed mindset individual if they had a summed score of 3 or below on the Implicit Theories of Personality measure.

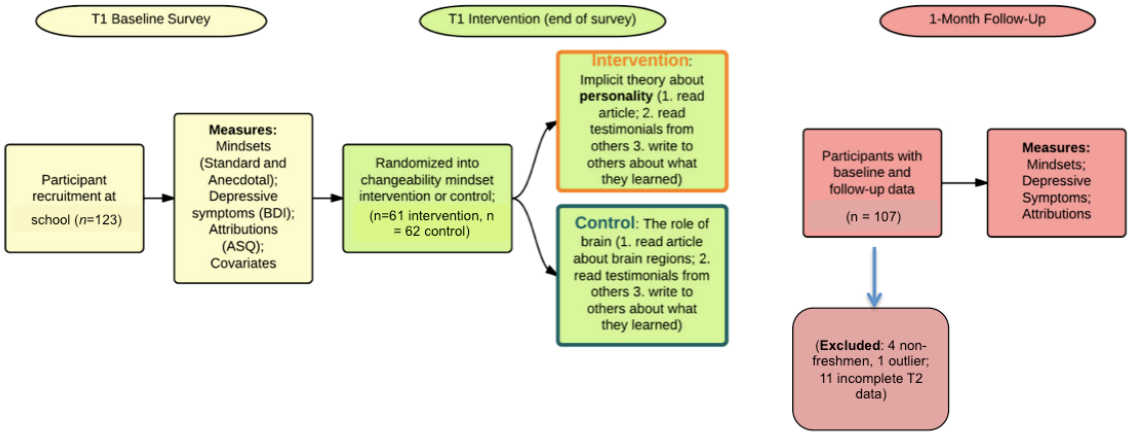


Figure 3. Flowchart of study procedures.

Table 2

Baseline Differences between Dropout Participants and Full Sample

	Full Sample *M(SD)*	Dropout Sample *M(SD)*
T1 Depression	8.53 (6.84)	10.27(6.33)
T1 Mindsets	2.74 (.98)	3.05(.65)
T1 Neg stable attributions	4.32 (.80)	4.42(.74)
Locus of Control	10.62(4.6)	14(5.39)
Condition	.47(.50)	.64 (.50)
N	118	11

Notes: Eleven participants did not participate in one-month follow-up study. Higher values of mindset reflect a more changeability mindset. Higher values of negative stable attributions represent more maladaptive beliefs. Higher values of depressive symptoms (untransformed) represent more severity of depression. Lastly, higher values of locus of control indicate a more external locus of control.

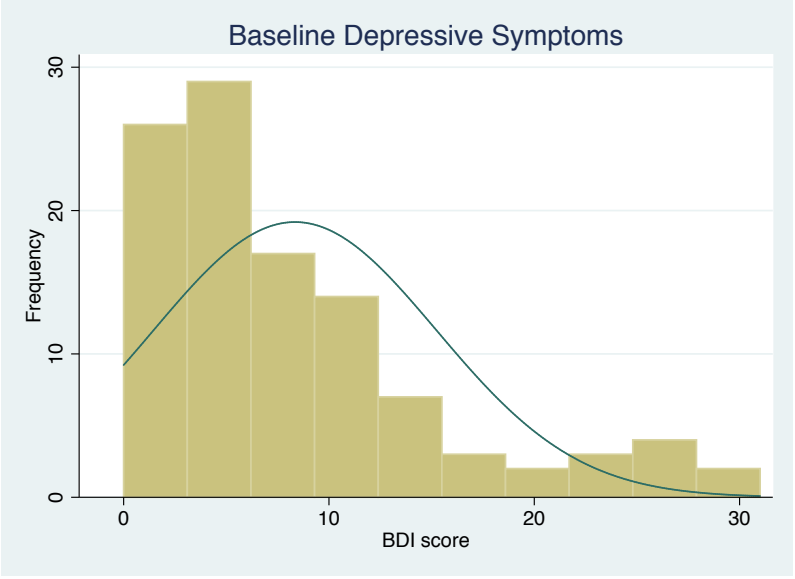
Table 3

Changes in Mindsets, Attributions, and Depressive Symptoms over Time by Condition

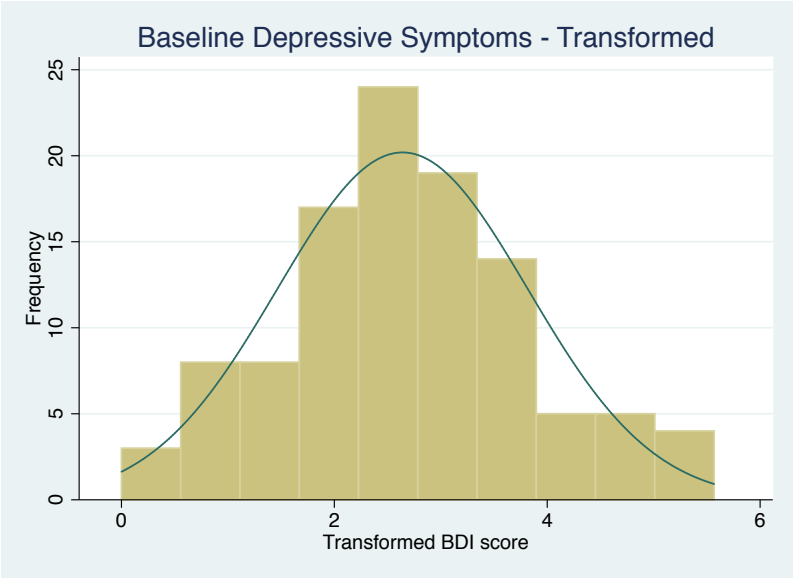
Pre-intervention variable	T1 Control *M/ %*	T1 Intervention *M/%*	T2 Control *M/%*	T2 Intervention *M/%*
Fixed Mindset (categorical)	59%	41%	64%	36%
Mindset	2.50	2.95	2.52	3.04
Depressive Symptom	8.29	8.41	8.12	7.96
Stable Attributions-Neg	4.96	4.85	4.41	4.55
N	58	49	58	49

Notes: Individuals were categorized as a fixed mindset individual if they had a summed score of 3 or below on the Implicit Theories of Personality measure. Higher values of mindset reflect a more changeability mindset. Higher values of negative stable attributions represent more maladaptive beliefs. Higher values of depressive symptoms (untransformed) represent more severity of depression.

a.

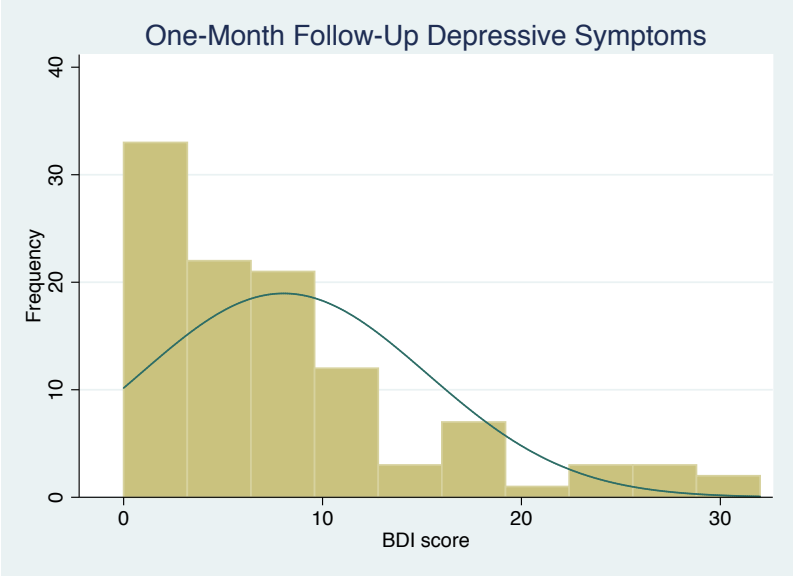


b.



Figures 4a –d. Graphs of untransformed and transformed depressive symptoms. Graphs a and c represent untransformed depressive symptom scores at baseline and one month post-intervention, respectively. Graphs b and d represent transformed depressive symptom scores at baseline and one month post-intervention, respectively. The symptom score distributions become normal after square root transformation.

c.



d.

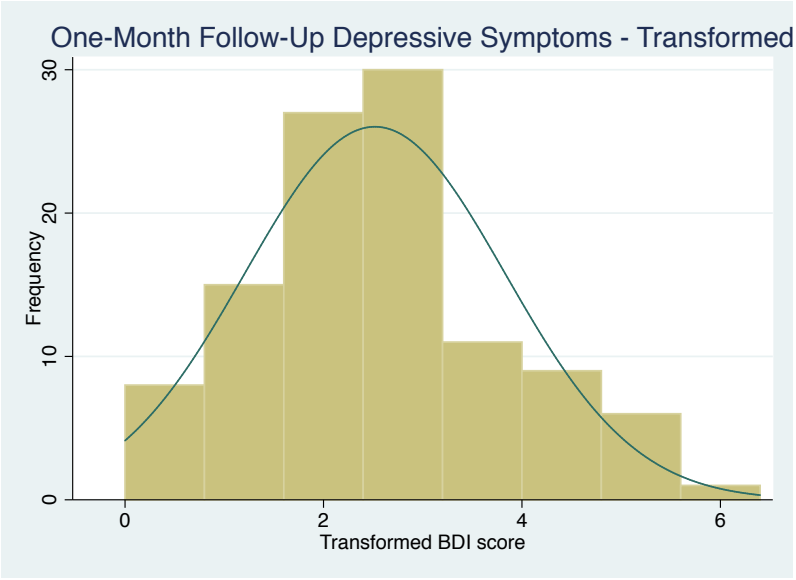


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Table 4

Correlations between Depression, Mindsets, Locus of Control, and Attributions

	1		2		3		4		5		6
1. T1 Depression											
2. T2 Depression	.71	***									
3. T1 Mindsets	.06		.02								
4. T2 Mindsets	-.03		-.10		.71	***					
5. T1 Neg stable attributions	.14		.00		.01		-.08				
6. T2 Neg stable attributions	-.05		-.10		-.06		-.04		.61	***	
7. Locus of control	.41	***	.35	**	-.14		-.26	**	.12		.13

Notes: Higher values of mindset reflect a more changeability mindset. Higher values of negative stable attributions represent more maladaptive beliefs. Higher values of depressive symptoms (untransformed) represent more severity of depression. Higher values of locus of control indicate a more external locus of control. *<.05; **<.01; ***<.001.

Table 5

Effects of Mindsets on Baseline Depression and Incremental Validity of Mindsets

	1			2			3		
	b	*t*	*p*	*b*	*t*	*p*	*b*	*t*	*p*
Mindset (T1)	.062	.62	.534	.061	.63	.530	.024	.24	.810
Neg attributions				.230	1.79	.077	.131	1.02	.309
Locus of control							.099***	3.54	.001
Sex							.265	1.07	.287
African American							-.861	-1.98	.051
Hispanic							-.026	-.04	.969
Asian							-.239	-.93	.355
Biracial/ Other							-.009	-.03	.974
Low-middle class							1.424	1.82	.072
Middle class							1.190	1.53	.130
Upper-middle class							.755	.99	.322
Upper class							.646	.85	.396
GPA							-.621	-1.07	.286
Intercept	2.512***	8.77	<.001	1.522	2.35	.020	2.588	.95	.346
R^2 =	.003			.028			.251		
ΔR^2 =				.025		.086	.223		.007
N =	118			118			109		

Note. The effects of mindsets on transformed depressive symptoms were estimated using hierarchical linear regressions. The depressive symptoms here represent one's depression score on the BDI, such that higher values of depressive symptoms reflect greater severity of depression. Higher values of mindset reflect more changeability mindset at baseline (T1). Higher values of stable attributions represent more maladaptive beliefs at baseline. Higher values of locus of control indicate a belief of external locus of control. In model 3, covariates were included. *b* = unstandardized coefficient. *<.05; **<.01; ***<.001.

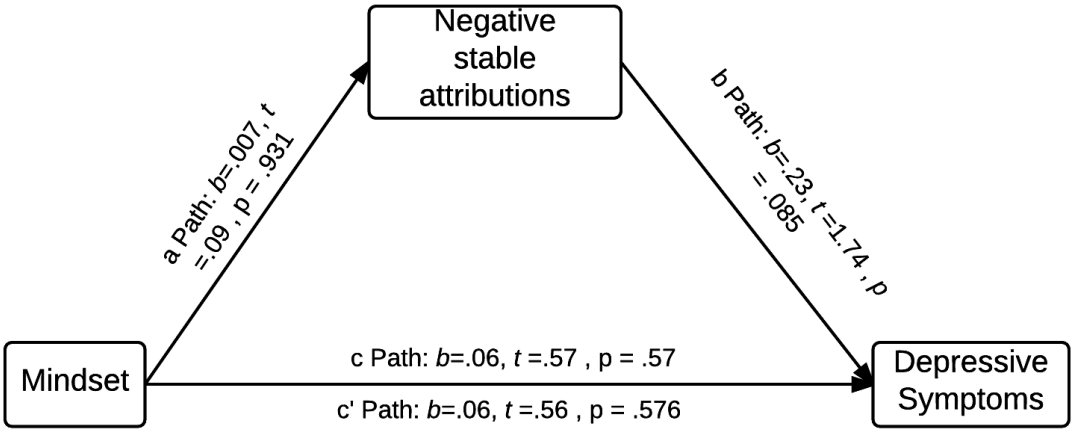

Figure 5. Mediational analysis: Stable attributions as a potential mediator for the effects of mindsets on baseline depression. Models examined the direct and indirect effects of mindset on baseline depressive symptoms on the BDI-II, mediated by negative stable attributions. *b* = unstandardized coefficient. All paths were estimated with ordinary least square regressions.

Table 6
Effect of Mindset Intervention on Depressive Symptoms One Month Post-Intervention

	1			2			3			4		
	b	*t*	*p*	*b*	*t*	*p*	*b*	*t*	*p*	*b*	*t*	*p*
Condition	-.083	-.32	.748	-.109	-.41	.685	-.090	-.33	.741	.152	.48	.633
T1 Mindset				.060	.44	.659	.051	.38	.707	.105	.65	.515
Negative stable attributions							-.111	-.72	.476	-.224 ***	-1.22	.225
Locus of control										.110	3.08	.003
Sex										.455	1.18	.240
African American										-.937	-1.27	.207
Hispanic										.283	.34	.733
Asian										.068	.20	.845
Biracial/ Other										.033	.06	.956
Low-middle class										1.012	1.22	.225
Middle class										.503	.60	.553
Upper-middle class										.578	.74	.463
Upper class										.627	.80	.424
GPA										-.258	-.31	.759
Intercept	2.556 ***	15.31	<.001	2.407 ***	6.37	<.001	2.915 ***	3.31	<.001	2.179	.57	.570
R^2 =	.001			.003			.008			.173		
ΔR^2 =				.002		.652	.005		.472	.165		.135
N =	107			107			107			99		

Notes: The effect of changeability intervention on transformed depressive symptoms (post-intervention) was estimated using linear regression. The depressive symptoms here represent one's depression score on the BDI, such that higher values of depressive symptoms reflect greater severity of depression. Higher values of mindset reflect a more changeability mindset. Higher values of stable attributions represent more maladaptive beliefs. Higher values of locus of control indicate a more external locus of control belief. In model 4, covariates were included. *b* = unstandardized coefficient. *<.05; **<.01; ***<.001.

Table 7

Effects of Mindsets on Baseline and Post-Intervention Depression, Moderated by Locus of Control

	1			2		
	b	*t*	*p*	*b*	*t*	*p*
Mindset (Baseline)	-.060	-.20	.838			
Mindset (Post-Intervention)				.398	.94	.350
Locus of control	.046	.57	.572	.196	1.79	.076
Mindset x LOC	.019	.63	.531	-.039	-.97	.332
Intercept	1.804*	2.22	.028	.476	.40	.691
N =	118			107		

Notes: The effects of mindsets on transformed depressive symptoms were estimated using linear regressions. The first regression examined the *baseline* mindset x locus of control interaction effect on baseline depression. The second regression examined the post-intervention mindset x locus of control interaction effect on post-intervention depression for all individuals. The depressive symptoms here represent one's depression score on the BDI, such that higher values of depressive symptoms reflect greater severity of depression. Higher values of mindset reflect a more changeability mindset. Higher values of stable attributions represent more maladaptive beliefs. Higher values of locus of control indicate a more external locus of control belief. *b* = unstandardized coefficient. *<.05; **<.01; ***<.001.

Table 8

Effect of Mindset Change on Depressive Symptoms One Month Later, Moderated by Locus of Control

	1			2		
	b	*t*	*p*	*b*	*t*	*p*
Mindset change	.793*	2.21	.029	.661	1.85	.067
Locus of control	.079**	2.82	.006	.075*	2.33	.022
Mindset change x LOC	-.099**	-3.12	.002	-.090**	-2.96	.004
Sex				.170	.60	.549
Race				.051	.61	.546
Socioeconomic class				.101	.72	.475
GPA				.111	.17	.869
Intercept	1.682***	5.60	<.001	.533	.18	.861
R^2 =	.162			.165		
N =	107			99		

Notes: The effect of mindset change on transformed depressive symptoms was estimated using linear regression. The depressive symptoms here represent one's depression score on the BDI, such that higher values of depressive symptoms reflect greater severity of depression. Higher values of mindset change reflect an increase in changeability mindset from baseline to Time 2 one month post-intervention. Higher values of locus of control indicate a more external locus of control belief. *b* = unstandardized coefficient. *<.05; **<.01; ***<.001.

Table 9

Descriptive Statistics of Depressive Symptoms One Month Later Based on Locus of Control and Mindset Change

	External LOC & More Fixed Mindset *M (SD)*	External LOC & More Changeability Mindset *M (SD)*	Internal LOC & More Fixed Mindset *M (SD)*	Internal LOC & More Changeability Mindset *M (SD)*
Depressive Symptom Change	-.22 (.85)	-.14 (.84)	-.53 (1.57)	.17 (.64)
T2 Depressive Symptoms	14 (9.49)	6.47 (6.17)	5.49 (3.57)	6.24 (5.12)
N	28	19	35	25

Notes: Individuals were categorized based on locus of control and amount of mindset change over one month. Individuals with a score above 11 (mean) were categorized as having an external locus of control. Mindset change was calculated by subtracting T2 mindset from T1 mindset, such that a positive score on mindset change represents a more changeability mindset (above 0) whereas a negative score on mindset change represented a more fixed mindset (below 0) over time. T2 depressive symptoms were a sum of untransformed depressive symptoms one-month post-intervention.

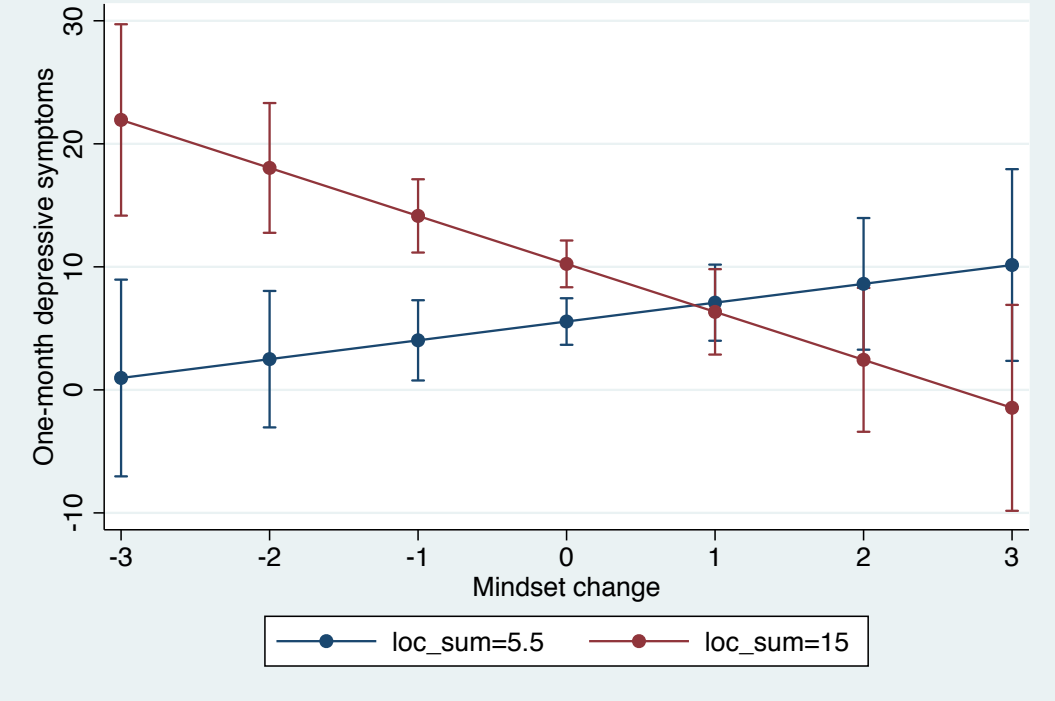

Figure 6. Marginal effect of mindset change on untransformed depressive symptoms one month later, at different levels of locus of control. Locus of control score of 5.5 represents more internal LOC (1 SD below the mean) whereas a score of 15 represents more external LOC (1SD above the mean).

Table 10

Simple Effect of Mindset Change on Depressive Symptoms One Month Later, Moderated by Locus of Control

	Depressive Symptoms		
	b	*t*	*p*
Mindset Change, Moderated by LOC (1SD above) - External	-.705**	-3.52	.001
Mindset Change, Moderated by LOC (1SD below) - Internal	.194	1.00	.322
R^2 =	.162		
N =	107		

Notes: The simple effect of mindset change on transformed depressive symptoms was estimated using linear regression. Regressions were moderated by locus of control, which was either centered at 1 Standard Deviation above the mean (more external) or below the mean (more internal). The depressive symptoms here represent one's depression score on the BDI, such that higher values of depressive symptoms reflect greater severity of depression. Higher values of mindset change reflect more changeability mindset at Time 2 one month post-intervention than baseline before intervention. Higher values of locus of control indicate a more external locus of control belief. *b* = unstandardized coefficient. *<.05; **<.01; ***<.001.

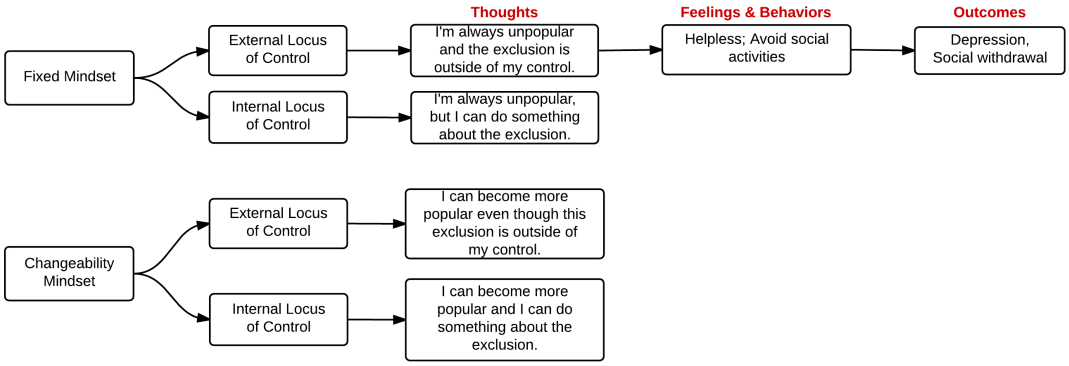

Figure 7. Modified model of the effects of mindsets on depression, depending on locus of control.

Supplement

Implicit Personality Theory Questionnaire (Dweck, 1999)
Items are on a 6-point Likert scale from Strongly Agree to Strongly Disagree.

Read each sentence below about YOURSELF and mark the answer that shows how much you agree or disagree with it. There are no right or wrong answers.

1. Your personality is something about you that you can't change very much.
2. You can do things to get people to like you, but you can't change your real personality.
3. You are a certain kind of person, and there is not much that can be done to really change that.
4. You can do things differently, but the important parts of who you are can't really be changed.

Anecdotal Measure of Mindsets (Adapted from Erdley & Dweck, 1993)

These students have just started college at Emory. For each anecdote, rate the following on an 8-point Likert scale of "Pretty much the same" to "Very different."

A) In a few weeks, do you think he/she would seem pretty much the same or different?
B) How will he/she be in the future?

1. JM is shy in class, and he does not make any eye-contact with his peers or participate in seminar discussion.
2. SH is a diligent student who finishes all of her reading assignments. She highlights key points in the readings and writes down questions on the side.
3. MC is afraid to try anything new. She turned down her roommate's invitation to sightsee Atlanta.
4. AL is outgoing. He has introduced himself to his dormmates and talks to anyone he does not know.
5. CD can get upset and stressed easily. She is worried about doing a good job on the first writing assignment in her freshman seminar.
6. BJ is easy-going and trusting of others. She allows her new classmate borrow her lecture notes.
7. ZE does not want to put in much work to studying and his assignments. He believes that college should be all about having fun.
8. SW is amazed by all the opportunities available at Emory and wants to join at least 3 extracurricular activities this fall.
9. GC does not like people in general. She does not believe that people are nice.
10. Although EN has two quizzes coming up, he does not feel stressed or worried about them.

Details about the Intervention Procedures and Content

The present intervention was based on the changeability mindset intervention implemented by Yeager et al., (2013) and Miu & Yeager (in press). At their first visit to the laboratory, participants were asked to help summarize an article and explain its concept to next year's college freshmen. After participants completed a brief online survey, they were randomized into either receiving the intervention or the control condition. As discussed in the manuscript, participants were first presented scientific information in support of the idea that people, particularly themselves, have the potential to change. This involved reading a scientific article showing that individuals' behaviors are controlled by "thoughts and feelings in their brains," and that such pathways in the brain can be changed. Participants read a scientific article about a "growth mindset" with the following instructions:

> "Below is an article reproduced from a popular magazine called Psychology Today, and it was published this year. It summarizes some scientific research on the "growth mindset." We need your help picking out the most important points for students like you. Your assignment is to read the article and then summarize the three most important things that a student like you would need to know in order to use the growth mindset."

To further make the article more relevant to college freshmen, the article began with a relevant anecdote about a person who talked to a friend about how she became less shy and awkward in the dormitory. The person stated:

> "Not everybody is stuck on one personality; over time, **people can change** through practice and when their brain makes new connections. My dormmates and I can just grow out of things. When I used a "Growth Mindset," things started turning out better."

Next, the article discussed the scientific evidence for the growth mindset, with statements such as:

> **"People's personalities live in their brains, and the brain can be changed.**
>
> I first read the research of Dr. Daniel Lawrence from Emory University. I learned that people don't do things because of some label that people use to describe them. They do things because of the thoughts and feelings that they have—thoughts and feelings that live in the brain, and that can be changed.
>
> When you have a thought or a feeling, the pathways of neurons in your brain send signals to other parts of your brain that lead you to do a behavior. By changing these pathways, you can actually change and improve how you behave after challenges and setbacks. Everyone's brain is a "work in progress!"

The article then summarized the findings of actual research studies that documented people's ability to change. After participants read and summarized the article, they were asked to explain the article and ideas to future college freshmen. Participants first read

sample quotes that were purportedly written by previous upperclassmen last year. Each of these quotes involved a time when the upperclassmen felt excluded as well as how they used the growth mindset to remind themselves that people can change. For example, one quote was:

> "Recently, people have been looking down on me. I was sitting in class one day minding my own business and he turned and started implying that he got a higher midterm grade than I did. Later that day I was in bio and this girl from my dorm was talking to her friends. I passed by with my 3 friends (the only good friends) and she told her friend, "Yeah, she's a loner in my dorm!" Both statements made me feel really upset and like a loser.
>
> However, although I was very upset, I have gotten over it because no matter how much people make me feel bad now, the insults aren't going to last forever. Maybe they have low self-esteem, so they pick on me. As they mature and change they'll stop acting so foolish. They might even realize how much pain they cause others and they'll decide to change.
>
> Also, I know that as I grow and get older I'll develop more friends. And I have a lot of friends outside of dorm or class that mean a whole lot to me too. I won't always be looked down on and maybe some of these people will change because change can always happen."

Next participants wrote their own version to future college freshmen. This activity is based on the "self-persuasion" or "saying-is-believing" design to help participants internalize messages without overtly convincing them (Aronson, 1999; Aronson et al., 2002; Walton & Cohen, 2011).

Written Samples from Students in the Intervention

1. Nothing in this world is certain, but for the most part, things are also never permanent. When I was having trouble with my roommate, I was certain that I was going to have a terrible year and I would never get enough sleep or enjoy being in my room. I didn't want to develop a relationship with my roommate because I could tell she had her own intentions and having a relationship with me wasn't one of them. Now, a few weeks in, I am on better terms with my roommate. Why? Because we just talked. One night we just had a conversation about our lives and what we were bringing to the table. Developing a relationship with her has helped me feel more comfortable in my room and also made living with her a lot easier. She is more considerate of me and my needs because we are friends and we care about each other.

2. I think that I would say that it is best to find comfort in the people who you are the closest with ,but also don't be scared to go talk to people. I ended up sitting with people I didnt know and talking to them before I left the event. It is actually important to put yourself in those sorts of situations to grow as a person. / I am too dependent on other people, but having the ability to talk to others is so important. I think that taking uncomfortable situations like that and trying to make them pivotal, learing, growing and changing moments is really importnat. / It is clearly easier said than done, to go and talk to a stranger, but it is so rewarding and much nicer than sitting alone. I would say give it a shot, but if it doesnt work out, always rely on your close friends.

3. Throughout high school I was pretty shy. I felt like I was trapped inside my own insecurities and I could never really express my true personality. So going to college I was determined to come out of my shell and really make an effort to make friends and be more outgoing. It's only been three weeks since move-in day and I already feel so much better about myself. Because I took the initiative to get to know people and stopped worrying so much about what others thought of me, I've gotten to know some really amazing people at Emory. I guess the key is just to strike up conversations with people, even if you feel uncomfortable. People here are friendly and want to make friends, just like you.