Mindfulness, Negative Cognition and Mental Health

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Abstract

Objectives**.** The present study aimed to investigate the underlying mechanism of how dispositional mindfulness works in promoting mental health by taking negative cognition into account. Specifically, the mediating effect of negative cognition between mindfulness and mental health was examined.

Methods. A Snowball sampling method was adopted. One hundred and eleven undergraduate students of the City University of Hong Kong completed an online questionnaire that measured trait mindfulness, dysfunctional attitude, anxiety, depression and life satisfaction.

Results**.** The present findings revealed that mindfulness was inversely associated with anxiety and depressive symptoms as well as positively correlated with life satisfaction. Negative cognition was found to mediate the effect of trait mindfulness on anxiety and depressive symptoms. The relationship between mindfulness and life satisfaction, however, was not mediated by negative cognition.

Conclusion. The present study increases the understanding of how mindfulness works in promoting mental health. It provides empirical evidence that reduction in cognitive distortion may be an important change mechanism by which mindfulness leads to better well-being. The current findings also contribute to our knowledge regarding the effect of negative cognition on mental health.

Introduction

The number of studies on mindfulness (Kabat-Zin, 2003) has increased rapidly in recent years from fewer than 80 in 1900 to over 600 in 2006 (Brown, Ryan, & Creswell., 2007). Generally speaking, previous research shows that dispositional mindfulness is positively correlated with mental health. Nevertheless, the underlying mechanism between mindfulness and mental health is still unclear (Shahar et al. 2010).

Some scholars (e.g. Lewinsohn et al. 2000) suggest mindfulness training may bring positive cognitive changes, thereby promoting mental health. Supporting the argument, some empirical studies have revealed that the effectiveness of mindfulness on well-being is mediated by negative cognition (e.g. Kiken & Shook, 2012).

Although mindfulness and negative cognition were both found to be correlated with

mental health, however (e.g. Brown & Ryan, 2003; Bishop et al. 2004), to the best of my knowledge there have been no previous attempts to include these three variables in a single study investigating their relationship. To advance the literature on the mechanism of how mindfulness works from cognitive perspective, the mediating role of negative cognition between mindfulness and mental health is examined in the current study. A literature review on the core variables included in this study is provided below.

Literature Review

Mindfulness and mental health
Mindfulness originates from the ancient meditation practice of Buddhism and is the core doctrine (Ramel et al. 2004). Kabat-Zin (2003) defined mindfulness as concentrating on the present moment without a judgmental attitude. In other words, mindfulness is the general propensity of acceptance and awareness. According to Kabat-Zin (2003), people differ in their willingness to be aware and to maintain focus on the present moment. One of the goals of mindfulness is to make people aware, observe, and react non-automatically to sensation, and thoughts. Meditation is a common strategy for increasing the mindfulness of individuals.

Recently, some propositions have been put forward in an attempt to explain the underlying mechanism of mindfulness. For example, it has been suggested that mindfulness serves to increase one's awareness of present (here-and-now) experience to promote generation of positive affect, which, in turn, leads to a faster recovery from negative emotional states, and increase one's ability to alleviate adverse physiological effects (Brown & Ryan, 2003). In support of this argument, mindfulness has been revealed to be positively associated with life satisfaction (e.g. Brown et al. 2007), but negatively correlated with depression and anxiety (e.g. Carlson & Brown, 2005), the three primary indicators of mental health suggested by Headey et al. (1993). In the past decades, mindfulness-based interventions have been developed to treat and prevent psychopathological symptoms (Roemer & Orsillo, 2003). Empirical evidences have shown the efficacy of mindfulness-based intervention on reducing anxiety, and depressive symptoms. For example, Mindfulness-Based Cognitive Therapy (MBCT) and Mindfulness-Based Stress Reduction (MBSR) were both found to be effective in reducing depressive and anxiety symptoms (Segal, Williams, & Teasdale, 2002; Kabat-Zinn, 2003;).

Measurements of Mindfulness
Two psychological inventories are widely used to measure the general tendency of mindfulness. The Kentucky Inventory of Mindfulness Skills (KIMS; Baer et al. 2006) relates to self-compassion, and higher levels of emotional intelligence, and the Mindful Attention Awareness Scale (MAAS; Brown &r Ryan 2003) relates more to positive affect,

vitality, and optimism, and is inversely correlated with unpleasant affect. Argus and Thompson (2008) reported that MAAS was negatively and significantly associated with depressive symptoms. A robust positive association between life satisfaction and MAAS was shown in the study conducted by Brown and Ryan (2003). Since we aimed at studying the association between mental health and mindfulness, the present study only adopted MAAS to measure trait mindfulness as it is more likely to be correlated with mental health.

Mindfulness and Cognitive Changes

As shown above, there are empirical evidences supporting the effectiveness of mindfulness promoting mental health and reducing psychopathology (e.g. Brown et al. 2007). The mechanisms through which mindfulness leads to reduction in psychopathological symptoms are still largely unknown, however (Shahar et al., 2010). One of the proposed explanations is that mindfulness changes one's cognitive process, thereby benefiting mental health. By enhancing the clarity and vividness of present experience, mindfulness helps people to withdraw from automatic negative thinking patterns and discriminated thoughts. According to the theory proposed by Ramel et al. (2004), mindfulness practice can help people to modify depressive symptoms associated with cognitive variables such as rumination and dysfunctional belief, as people with high dispositional mindfulness are able to identify habitual patterns and destructive mental content at an early stage. In this mode, people can be present in reality and aware of their discriminated cognitive reaction (Brown et al. 2007). Also, people with high mindfulness can regard their negative experiences as passing incidents that temporarily capture attention (Kabat-Zinn, 1982). Hence, people with high dispositional mindfulness find it easier to notice their habitual thoughts, disengage from automatic mental patterns and have a more nonjudgmental and decentering perspective on cognitions.

Some researchers have found the mediating role of rumination between mindfulness and depression. For instance, Chamber, Lo, and Allen (2008) recruited 20 participants for a 10-day intensive mindfulness meditation programme. The participants reported diminished rumination levels and depressive symptoms compared with the control group. Ramel et al. (2004) also reported that participants who attended an 8-week mindfulness course reported diminished rumination and lower levels of depression. Labelle, Cambell, and Carson (2010) conducted an experimental study in which 77 female patients with oncology were recruited. Forty-six of the participants received Mindfulness-Based Stress Reduction (MBSR) intervention for eight weeks. It was reported that a mediating effect of rumination on MBSR to reduce depression was found.

In addition to rumination, negatively-biased cognition also leads to depression and anxiety; and related with mindfulness. The mediating role of negative cognition on mindfulness is under-researched, however. Watson, Wiese, Vaidya, and Tellegen. (1999) suggested mediation analyses are useful to uncovering the mechanisms, which, in turn,

advance the efficacy of a treatment programme. In the present study, the mediation effect of negative cognition between mindfulness and mental health is investigated.

Negative Cognition and Mental health

Ciesla and Roberts (2007) categorised rumination by individual thinking style, such as "obsessive" or "repetitive" rather than the thinking content. Conversely, the concept of negative cognition is characterised by what individuals think, such as irrational belief and maladaptive attributions (Beck, 1987).

According to the cognitive theory (Beck et al. 1987), negative cognition can generally include unrealistic and rigid beliefs, particularly regarding the self, future, and the world. Negative cognitive style is correlated with psychopathological symptoms by interpreting the world irrationally. Beck suggested maladaptive and negatively-biased cognitive style is a key factor leading to depression. According to his cognitive theory (Beck, 1987), dysfunctional schemata are the underlying major reason for depression. Dysfunctional schemata are usually the result of some tragic negative childhood experiences, such as abused or social isolation. Beck (1987) defined schemata as enduring cognitive structures that organize external messages in a systematic way and code, screen, and evaluate the incoming information from the environment. If the schemata are negatively biased, the individual will tend to interpret external stimuli from a distorted perspective. In consequence, s/he will have biases in memory, perception and attention, which leads to more negative thoughts and consequently depressive symptoms. Literatures have found an association between negative cognition and depression. For example, Lewinsohn et al. (2000) conducted a study among 1507 adolescents and found that high level of negative cognition was a significant contributor to the onset of major depressive disorder. Other previous studies have also shown that negative cognition is positively correlated with recurrence of depression (e.g. Segal et al. 2002).

In addition, negative cognition is assumed to be related to anxiety level. Beck (1979) hypothesised that anxiety disorders can be induced by faulty and distorted ways of thought and the biased processing of external stimuli. Clark et al. (1999) also suggested that people would be more vulnerable to anxiety disorder if they held a negative view of the future. In previous studies (e.g. Williams et al., 1997), it has been revealed that individuals with anxiety disorder usually biasedly attend to negative cues. To explain the negatively biased attention of people with anxiety disorders, a model of childhood anxiety was developed by Weems and Watts (2005), who suggested that childhood anxiety was induced by three negative cognitive processes involving negatively-biased attention toward threatening stimuli, negatively-biased interpretation of events and biasedly recall of threatening memories. It was posited that these three cognitive components are mutually interacted, thereby generating a heightened level of anxiety. In a later study (Reid, Salmon& Lovibond, 2006), 133 children between the ages of eight and14 years were recruited.   The result revealed that high levels of anxiety were

significantly correlated with cognition biased. Children with higher anxiety level were shown to be more likely to pay attention to negative information, interpret ambiguous situation as negative and recall negative words. Yet, the association between negative cognition and adult anxiety has seldom been tested.

Also, researchers have argued that negative cognition is associated with a lower level of well-being by triggering unnecessary emotional disturbance (e.g. Ciarrochi, 2004). Most of the previous researches focused on examining the relationship between negative cognition and negative indicators of well-being such as anxiety and depressive symptoms, and few has tried to investigate the association between negative cognition and positive indices of well-being. Ciarrochi (2004) compared the relationship between negative cognition, and positive and negative indices of well-being. He used seven negative indices of well-being including anxiety and depressive symptoms, and three positive indicators of well-being including life satisfaction in his study. Although it was found that dysfunctional belief accounted for more variance in negative indices of well-being, life satisfaction was significantly and negatively correlated with dysfunctional belief. Another study also provided empirical support for the notion that negative cognition was associated with quality of life. Wong, Chan and Lau (2010) showed that dysfunctional attitudes were negatively correlated with some domains of quality of life including leisure activities and social relationship satisfaction.

Given the above literature, it is reasonable to assume that negative cognition is correlated with depression, anxiety and negative cognition. In the present study, the Dysfunctional Attitude Scale (DAS) is adopted to measure negative cognition as defined in Beck's cognitive theory and have been widely used in general and clinical population researches (Ciarrochi, 2004).

The Mediation Effect of Negative Cognition on Mindfulness

Both empirical and theoretical works (e.g. Frewen et al. 2008) have posited that mindfulness is not only associated with thought context as a ruminative response style, but also with thought content as a cognitive style. Segal et al. (2002) suggested that people with negative cognition tend to classify incoming stimuli as unpleasant experience and trigger a distorted interpretation. If, however, a person is mindful, s/he tends to pay more attention to what is actually occurring, but not biasedly attend to negative areas in a particular situation. Thus, mindfulness can help reduce negative bias by facilitating an objective contact with life. An experiment was conducted to compare the negatively biased attention between participants who received brief mindfulness induction and those who did not (Kiken & Shook, 2011). The results showed that participants who received a brief mindfulness induction demonstrated a less negative bias and even a greater endorsement of optimistic beliefs. Another study conducted by Frewen et al. (2008) found that individuals with higher dispositional mindfulness reported less negative thoughts. As mindfulness is related to lower negatively biased cognition, negative

cognition is obviously a mechanism through which mindfulness reduces psychopathological symptoms and enhances well-being. A post-hoc test conducted by Gilbert and Christopher (2010) showed that dispositional mindfulness was a significant contributor to psychopathological symptoms only when the variance attributable to negative cognition was not taken into account. It indicated that mindfulness was not able to predict psychopathological symptoms above and beyond negatively- biased cognition.

The above results collectively imply that the association between mindfulness and mental health can be at least partly accounted for by negative cognition. In other words, negative cognition plays a mediating role between mindfulness and mental health. This conceptual framework was empirically supported by the research conducted by Kiken and Shook (2012). In their study, questionnaires from 181 undergraduate psychology students were collected and the results showed that maladaptive cognition partially mediated the effect of trait mindfulness on emotional distress. Kiken and Shook (2012), however, did not divide emotional distress into specific subtypes. Also, they only calculated the overall factor loading of depression and anxiety and did not take positive indices of well-being such as life satisfaction into account. Headey et al. (1993) strongly recommended that we should measure life satisfaction separately from, depression and anxiety in general population surveys to avoid confusing the symptoms of these three different dimensions of mental health.   The present study adapts the study of Kiken and Shook (2012) to estimate the specific indirect effect of mindfulness through negative cognition on the three different dimension of mental health including depression, anxiety, and life satisfaction.

The Present Study

Objectives
In summary, the above literature showed that although there are increasing evidences supporting the relationship between mindfulness and mental health, the underlying mechanism is still unclear. The present study attempted to fill this research gap by:
1. Examining the relationship between negative cognition and three dimensions of mental health: depression, anxiety, and life satisfaction.
2. Estimating the mediation effect of negative cognition between mindfulness and the three dimensions of mental health: depression, anxiety, and life satisfaction.

Formulation of Hypotheses
In the light of the above literature review, we proposed that negative cognition would mediate the effect of mindfulness on mental health. The three primary indicators of mental health (Headey et al. 1993) namely, depressive symptoms, anxiety symptoms, and life satisfaction were used. Specifically, we predicted that:
H1: Mindfulness is negatively associated with psychopathological symptoms including

depressive and anxiety symptoms as well as positively related to life satisfaction;

H2: Negative cognition is positively associated with psychopathological symptoms including depression and anxiety as well as negatively correlated with life satisfaction;

H3: Negative cognition mediates the relationship between mindfulness and the three primary dimensions of mental health depression, anxiety and life satisfaction.

Methodology

Participants

One hundred and eleven undergraduate students were recruited from the City University of Hong Kong. Table 1 shows the demographic information. Participants' age ranged from 18 to 23 (M = 21.08, SD= 1.04). Seventy-three of the participants were female (65.8%) and 38 were male (34.2%). Forty-one participants were majors in psychology (36.9%). There were nine participants (8.1%) from year one, 44 (39.6%) from year two, 52 (46.8%) from year three, and six (5.4%) from year four. None of them were receiving medical treatment or mindfulness training.

Table 1
Demographic Characteristics of the Participants

		n	Percentage
Gender	Male	38	34.2
	Female	73	65.8
Grade	Year one	9	8.1
	Year two	44	36.9
	Year three	52	46.8
	Year four	6	5.4
Majoring in	Psychology	51	36.9
discipline	Business	17	15.3
	Human & Social Science	20	18.0
	Creative Media	12	10.8
	Building & Technology	2	1.8
	Others	9	8.1

Procedure

Ethical approval was granted by the Applied Social Study Department of the City University of Hong Kong. A snowball sampling method was adopted. Participants were recruited from the campus of the University between 4 January and 28 January 2013. Their email address was collected by face-to-face interview. Fifty emails enclosing a

brief introduction and a link to the web-based questionnaire were sent out to the participants from 1st February to 10th February 2013. Participants were recommended to forward the email to invite their peers to participate in the research. To prevent the same student from completing the questionnaire more than once, the web-based questionnaire system was adjusted to allow each computer to complete the questionnaire once only. Informed consent was obtained; voluntary participation was emphasised and that the participant would receive no incentive for participation. The whole assessment process for each participant took about 20 minutes. Finally, the data in the web-based questionnaire system were downloaded on 5 April 2013 and entered in SPSS for further analysis.

Measures

The Mindfulness Attention Awareness Scale (MAAS). The MAAS (Brown & Ryan, 2003) was used to measure the degree of dispositional mindfulness. It contains 15 items assessing the capacity to maintain attention, and ignore distraction and dispositional mindfulness. Each question is rated on a six-point Likert scale from one (almost always) to six (almost never). A higher score indicates a greater degree of trait mindfulness. The MAAS has been validated with cancer patient, college, and community samples (Brown & Ryan, 2003). In the present study, the back-translation method suggested by Brislin (1980) was used to ensure the meaning of the Chinese version of the MAAS was the same as the original one. The author first translated the questions from the original version of the MAAS to Chinese. Another bilingual person who majored in psychology helped to translate the Chinese version back into English. The Chinese versions of the MAAS were revisited to produce a final version. In the current study, the MAAS revealed high reliability ($\alpha = 0.76$).

Hospital Anxiety and Depression Scale (HADS). The HADS (Zigmond & Snaith, 1983) was used to assess the depression and anxiety level of the participants. This questionnaire is a self-reported measure for depression and anxiety in patients with mental and somatic problems. The HADS consists of 14 items which can be divided into two domains of anxiety and depression. Scores are based on different answer to each question. Higher total score indicates a higher level of anxiety or depression. Previously, the HADS has demonstrated high reliability ($\alpha = 0.93$) (Rajandram et al. 2011). The Chinese version of the HADS developed by Leung, Ho, Kan, Hung, and Chen (1999) was adopted. In the current study, the subtypes of both depression and anxiety revealed high reliability ($\alpha = 0.79$; $\alpha = 0.73$).

Dysfunctional Attitude Scale (DAS). The negative cognition of respondents was measured by the DAS. Based on Beck's cognitive theory of depression (1987), the DAS is a self-report instrument of maladaptive cognition. The short form of the DAS contains 40 questions assessing the unrealistic or inflexible cognition of individuals (Weissman & Beck, 1978). Each statement is rated on a seven-point Likert scale from one (totally

disagree) to seven (totally agree). Higher scores indicate a higher degree of maladaptive cognitions. Previous studies revealed high reliability and validity for the DAS (e.g. Hamilton & Abramson, 1983). The Chinese version of the DAS scale developed by Wong, Chan, and Lau (2008) was adopted and showed satisfactory internal consistency ($\alpha = 0.83$) in the current study.

Satisfaction with Life Scale (SWLS). Life satisfaction was measured by the SWLS. It is a widely accepted measure for assessing self-evaluation of subjective well-being (Diener & Emmons, 1985). It contains five items scored on a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree). The SWLS has shown a satisfactory reliability ($\alpha=.87$; Diener & Emmons. 1985). Also, the test–retest reliability over a two-month interval was high ($r =0.82$; Diener & Emmons, 1985). The SWLS was shown to be correlated with instruments of self-esteem and emotional distress (Diener & Emmons,. 1985). The back-translation method (Brislin, 1980) as mentioned above was used to translate the SWLS into Chinese version which showed a satisfactory internal consistency in the present study ($\alpha= 0.88$).

Demographic Measures. A self-designed session was used to obtain the demographic information of participants. They were required to give their gender, age, major, and grade. They also needed to report if they were receiving mindfulness training or medical treatment as these was considered as confounding variables.

Data Analyses

All the data were analysed by IBM SPSS Statistic 20.0. An independent sample t-test was first used to check for possible gender differences among variables. Pearson product-moment correlation was then conducted to explore correlations among variables.

Prior to the mediation analyses, all continuous measures were standardised (Preacher & Hayes, 2008). Mediation effects were tested in two steps. First, the stepwise method suggested by Baron and Kenny (1986) was used. Second, a bootstrapping procedure was used to further estimate the indirect effect of predictor on outcome variable through the mediator.

According to Baron and Kenny (1986), a mediation model should be tested in four steps. In step one, the association between the independent variable (*X*) and a dependent variable (*Y*) should be examined (path c). In step two, the association between the independent variable (*X*) and the mediator (*M*) should be tested (path a). In step three, the association between the mediator and dependent variables is examined (path b). In step four, the mediation effect (M) of independent variable r (*X*) on dependent variable (*Y*) after controlling for mediators should be addressed (path c'). These four paths are shown in Figure 1.

Path a   Mediator (*M*)   Path b

Path c (non-mediated effect)

Independent variable (*X*)

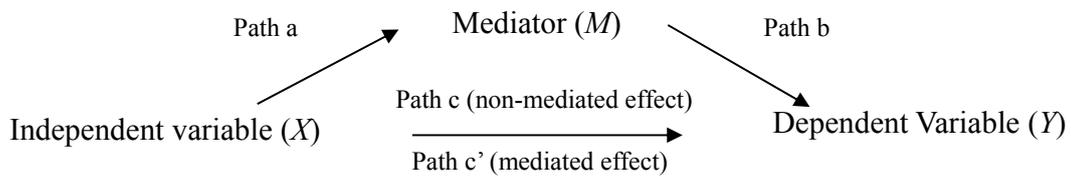Path c' (mediated effect)

Dependent Variable (*Y*)

Figure 1. The four paths of mediation model (Baron & Kenny, 1986).

Most current researchers recommended the use of bootstrapping procedure to estimate the indirect effects of mediation models when the sample size is small (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002: MacKinnon, Lockwood, & Williams, 2004). Thus, a SPSS bootstrapping macro developed by Preacher and Hayes (2008) was adopted to estimate all the indirect effects of mediation models. The bootstrapping macro allows testing of the total and indirect effects of predictor on outcome variable through one or more mediators by incorporating the stepwise methods of Baron and Kenny (1986) and bootstrapping procedures (Shrout & Bolger, 2002). Also, bootstrapping is useful for reducing the probability of type I error of asymmetric and other non-normal sampling distributions of a mediation model (MacKinnon et al. 2004) by allowing 5000 resamples to derive 95% confidence intervals (CIs).

With statistical power of 0.95, 111 participants and two predictors involving one independent variable and one mediator, the estimated effect size of the present study was considered as small to medium ($f^2 = 0.10$; Cohen, 1988).

Results

Descriptive Statistics
Table 2 gives the means and standard deviations for the major variables in the present study by gender. Independent samples t-tests indicated that there were no significant gender difference between major variables with all *p* >0.05. Among the samples of the current study, male and female participants shared similar levels of mindfulness, negative cognition, depression, anxiety and life satisfaction. Results suggested that gender was not likely to create any biases in the data, and thus gender was not controlled in further analysis.

Table 2
Means and Standard Deviations of Major Variables by Gender

	Male (n = 38)		Female (n = 73)		
	M	*SD*	*M*	*SD*	*t*
Mindfulness	50.47	7.42	51.27	8.24	.50
Negative Cognition	163.21	23.86	159.53	16.87	-.94
Depression	12.29	3.20	12.23	3.04	-.09
Anxiety	14.53	3.52	14.00	3.38	-.77
Life Satisfaction	21.05	5.83	20.88	7.35	-.13

Correlation Analysis

Table 3 shows the means, standard deviations and bivariate correlations between all major variables. Consistent with H1, mindfulness was negatively and significantly correlated with dependent variables of depression ($r = -0.19$, $p < 0.05$), anxiety ($r = -0.36$, $p < 0.01$) as well as positively correlated with life satisfaction ($r = 0.36$, $p < 0.01$). Also, mindfulness was negatively and significantly correlated with negative cognition as the proposed mediator ($r = -0.24$, $p < 0.05$).

Negative cognition was found to be positively and significantly correlated with depression ($r = 0.37$, $p < .001$) and anxiety ($r = 0.44$, $p < 0.01$). The relationship between life satisfaction and negative correlation was not, however, significant ($r = -0.12$, $p > 0.05$). Given path b (the association between mediator and dependent variable) was not significant, the mediation effect of negative cognition between mindfulness and life satisfaction was not further analysed.

Table 3
Mean, Standard Deviation and Correlations among Major Variables

Variables	1	2	3	4	5	*M*	*SD*
1. Mindfulness	—					51.00	7.94
2. Negative Cognition	-.24*	—				160.79	19.51
3. Depression	-.19*	.37**	—			12.25	3.08
4. Anxiety	-.36**	.44**	.52**	—		14.18	3.42
5. Life Satisfaction	.36**	-.12	-.46**	-.40**	—	20.94	6.84

*$p < 0.05$ **$p < 0.01$

Mediation Tests

First, the stepwise method of Baron and Kenny (1986) was used to estimate the mediation effect of negative cognition between mindfulness and depression. Figure 2 shows the mediation model of negative cognition as mediator between mindfulness and depression. As mentioned in the correlation analysis (3.3), the relationships between

mindfulness (*X*), negative cognition (*M*) and depression (*Y*) were significantly inter-correlated which indicates that paths a, b and c were all supported. To calculate the path c', after controlling for negative cognition, the direct (mediated) effect of mindfulness on depression was no longer significant (*β* = -0.11, *SE* = 0.1, *p* > 0.05). According to Baron and Kenny, if path c' was not significant; a full mediation effect of negative cognition between mindfulness and depression can be inferred.

The bootstrapping method was used to test the indirect effect of mindfulness on depression by negative cognition. According to Preacher and Hayes (2008), if the 95% bootstrap CIs from 5,000 bootstrap samples does not contain zero, an indirect effect can considered to be significant. The indirect effect of mindfulness through negative cognition was significant (*p* < 0.05) and estimated to be -0.08 with a 95% bootstrap CI of -0.02 to -0.18. The result was consistent with H3 in that negative cogntion mediated the effect of mindfulness on depression.
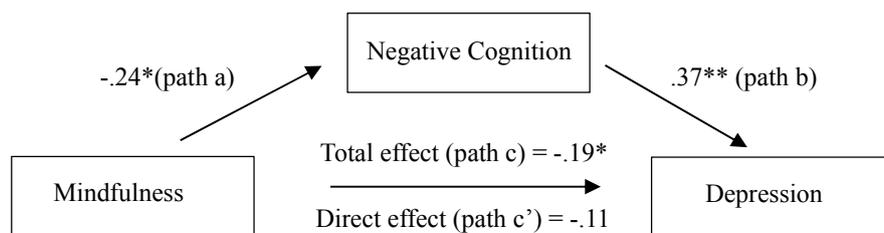

Figure 2. Mediation model of negative cognition as mediator between mindfulness and depression. *Note.* Values presented are standardised coefficient.
*p < 0.05 ****p* < 0.01

Similarly, Figure 3 shows the mediation model predicting anxiety. As mentioned in the correlation analysis (3.3), mindfulness, negative cognition and anxiety were inter-correlated which indicated that paths a, b, and c were all supported. To caculate the path c', after controlling for negative cognition as mediator, direct (mediated) effect of mindfulness on anxiety was still significant (*β* = -0.27, *SE* =0.09, *p* <0.01). Thus, since paths a, b, c and c' were all significant, only a partial mediation effect was indicated (Baron & Kenny, 1986).

Further, bootstrapping procedures were used to examine the indirect effect of mindfulness on anxiety through negative cognition. The indirect effect of mindfulness on anxiety throught negative cognition was -0.09 and significant (*p* <0.05, 95% CI [-0.03, -0.19]). The result was still consistent with H3 in that negative cognition partially mediated the effect of mindfulness on anxiety.
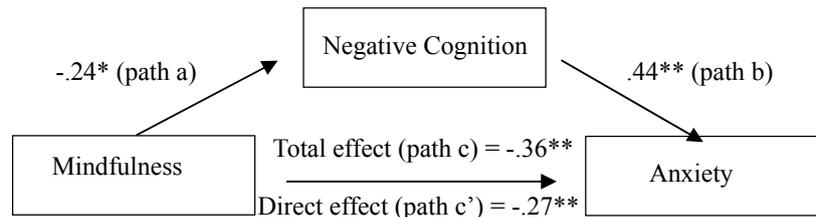
Figure 3. Mediation model of negative cognition as mediator between mindfulness and anxiety. *Note.* Values presented are standardized coefficient.
*$p < 0.05$ **$p < 0.01$

Discussion

Major Findings and Implications

The present study aimed to explore the underlying mechanism of how mindfulness works in promoting mental health by taking negative cognition into account. In summary, the following major findings were obtained:

A. Mindfulness was negatively and significantly correlated with depression and anxiety as well as positively and significantly correlated with life satisfaction

B. Negative cognition was positively and significantly correlated with depression and anxiety but not significantly associated with life satisfaction.

C. Negative cognition mediated the effect of mindfulness on depression and anxiety, but not the relationship between mindfulness and life satisfaction.

Overall, the present findings provide empirical evidence in support of the proposition that reduction in cognitive distortion may be an important change mechanism through which mindfulness promotes mental health.

Mindfulness and Mental Health

As predicted, dispositional mindfulness was inversely associated with depressive and anxiety symptoms and positively related to life satisfaction. These results are consistent with H1 and the literatures (e.g. Carlson & Brown, 2005). Also, they provide empirical support for Leary's (2004, p. 72) suggestion that an " accurate view of reality is a hallmark of psychological adjustment " and that as mindfulness was characterised by nondiscriminatory awareness, people with high trait mindfulness would allow inputs to enter consciousness in a simple awareness of what was taking place. Brown et al. (2007) also argued that mindfulness can be directly associated with mental health by facilitating clarity and decentering attention awareness to the world. The present findings reveal that mindfulness has a robust relationship with different dimensions of mental health which imply people with high dispositional mindfulness may have a higher ability to resist dysphoric and anxious affect, and enjoy a higher quality of life.

Negative Cognition and Mental Health

H2 predicted that negative cognition was positively associated with depressive and anxiety symptoms as well as negatively correlated with life satisfaction. First, in accordance to this hypothesis, the findings showed that negative cognition was significantly and positively correlated with depression. This finding corresponds with Beck's cognitive theory (1987) which assumed that maladaptive and negatively-biased cognitive style is the key factor leading to depression. In fact, negative cognition has been found to be associated with depression in a number of previous studies already (e.g. Segal et al. 2006). A meta-analysis review (Garratt et al. 2007) also suggested that cognitive changes such as less dysfunctional cognition were verified for use in predicting improvement in depressive symptoms. According to Teasdale's (1985) differential activation hypothesis (DAH), depressed mood activates negative biases in interpretations of experience that further exacerbate the negative processing of information. If individuals have a high level of negative dispositional cognition, their activated negative cognitive processing by depressed mood may be severe enough to further exacerbate the depressive symptoms and results in a positive feedback loop. Since mindfulness is negatively associated with both negative cognition and depression, it may imply that mindfulness is effective in interrupting the positive feedback loop in which negative cognition and depressed mood exacerbate each other.

Second, compared with depression, the relationship between anxiety and negative cognition is less likely to be studied. The present findings fill the research gap by showing negative cognition was not only correlated with depression, but also anxiety. Previously, research only investigated whether patients with anxiety disorders would show less maladaptive thinking after receiving behavioural cognitive therapy. For instance, Laberge et al (2000) found that patients with anxiety disorder showed a significantly lower dysfunctional attitude and fewer anxiety symptoms. Thus, the present findings extended previous finding by generalising the same results in a non-clinical population. Also, this result provides empirical support for Weems and Watts's (2005) model. In fact, their model was initially developed to explain the etiology of childhood anxiety disorder. They posited that the existing distorted cognition and negative interpretation of events and memory could biased the children's attention to the threatening part of a particular situation and away from neutral or positive aspects of the situation, thereby inducing higher level of anxiety. As the present study found that negative cognition was positively associated with anxiety among undergraduate students, the model developed by Weems and Watts (2005) may also be applicable in the study of adolescents and young adults.

Third, the present findings failed to support the assumption of H3 that negative cognition is inversely associated with life satisfaction and mediate the effect between mindfulness and life satisfaction. The result showed that negative cognition was not

significantly associated with life satisfaction which contradicted with Ciarrochi's finding (2004). Ciarrochi (2004) found dysfunctional attitude was significantly and negatively correlated with life satisfaction. Ciarrochi's result might be not very representative, however, as he controlled social desirability while estimating the predicting power of dysfunctional attitude on life satisfaction. Also, the correlation effect between dysfunctional attitude and life satisfaction he reported was small ($r = 0.13$, $p < 0.05$). An alternative explanation of the present findings may be provided by Elliot and Thrash (2002). They suggest that character strengths and cognitive vulnerabilities are not mere opposites, but distinct contributors to positive or negative indices of well-being. They assume that character strengths such as hopefulness, gratitude and spirituality can interact more directly with the mechanisms involved in positive affections, whereas negative cognition interact more directly with mechanisms implicated in negative affections. Therefore, the present findings might imply that negative cognition is more strongly associated with negative indices such as depression and anxiety, but not directly useful for enhancing positive indices of well-being, such as life satisfaction.

The Mediating Role of Negative Cognition

H3 predicted that negative cognition would mediate the effect of mindfulness on three dimensions of mental health: depression, anxiety and life satisfaction. In the present study, negative cognition was not found to correlate with life satisfaction; therefore, the mediation effect of negative cognition between mindfulness and life satisfaction is not supported. Yet, the present findings showed that there was a full mediation effect of negative cognition between mindfulness and depression. This result further confirmed the findings of Kiken and Shook (2012). Their study aimed at examining the mediation effect of negative cognition between mindfulness and emotional distress, and thus they only took the overall factor loading of depression and anxiety as a dependent variable. Their results only suggested a partial mediation effect of negative cognition between mindfulness and depression. This study provides stronger evidence that the association between dispositional mindfulness and depression can be fully mediated by negative cognition. Previous researches merely assumed rumination was the only cognitive attribute that can be accounted for the efficacy of mindfulness on depression. This finding add to the growing body of literature by identifying minimizing maladaptive cognition is another pathway of mindfulness to reduce depression. By showing that negative cognition is also a mediator between mindfulness and depression, the present study stressed that the conceptualisations of how mindfulness-based intervention is efficacious for treating depressive symptoms from a cognitive perspective. The findings implied that mindfulness can modify not only automatic thinking style, but also maladaptive cognition. This result is also in accord with the mindfulness theory proposed by Shapiro, Carlson, Astin (2006) which characterised mindfulness in terms of three primary components, namely decentering, deautomatisation and detachment (Bohart,

1983). When one can step outside immediate experience (decentering), undo the automatic process that control perception and cognition and adopt a phenomenological attitude (detachment), one will eventually reduce all negative cognitions which are induced by negative thought content and automatic thought pattern.

In addition, our result showed that negative cognition only partially mediated the effect between mindfulness and anxiety. It suggested that cognitive change can only account for part of the mechanism through which mindfulness leads to a reduction in anxiety. Thus, there might be other factors which contribute to this mechanism. Greeson and Brantley (2009) provided an alternative explanation of how mindfulness works to address anxiety. Mindfulness can help people to directly experience anxiety and gain a better insight into the fear emotion and themselves in relation to the world. Thereby, people can be more skillful in responding to threatening situations by employing better emotion regulation. Furthermore, mindfulness engages people in higher-order mental functioning including attention, awareness and compassion, which in turn effectively control the fear reactions by cortical inhibition of the limbic system.

Finally, since negative cognition was found to fully and partially mediate the effect of dispositional mindfulness on anxiety and depressive symptoms, the results of the present research may have an implication for mindfulness-based therapies for addressing depressive and anxiety symptoms. As cognitive therapy tends to focus on altering maladaptive thinking (Ramel et al. 2004), mindfulness-based intervention can be considered as a complementary treatment of cognitive therapy by addressing negative thought content. There is still a controversy over whether mindfulness should be considered as a "new wave" of psychotherapies or as a complement to cognitive therapies (e.g. Hofmann et al., 2010). This study provided significant insight by showing that cognitive change is also an important component behind the mechanisms of how mindfulness works.

Limitations and Further Study

Several important limitations should be taken into consideration when the findings of this study are interpreted. First, it adopted a snowball sampling method to recruit participants. Unlike probability sampling, snowball sampling method does not select participation units but is based on random selection. Thus, it is difficult to determine possible sampling error and extrapolate from the sample to the population (Biernacki & Waldorf, 1981). To guarantee the representativeness of the sample, a probability sampling method should be adopted in future work.

Second, there might be some bias in the measurements. Since we used online questionnaires to collect data, we had less control over the participants. We cannot guarantee that participants completed the online questionnaire themselves. Sax, Gilmartin, and Bryant. (2003) found that the reliability of online surveys was lower than that of presence questionnaires. Moreover, the data relied exclusively on self-report

instruments. The measurement may be subjective and vulnerable to bias. For example, the participants could be affected by social desirability bias (Nederhof, 1985), tending to give answers favoured by the reviewers. Also, repressive coping styles might lead the participants to have a higher tendency to choose the answers that minimise their emotional distress (Labelle et al. 2000). In future studies, strategies could be applied to minimise these effects. More objective measures of variables should also be used, such as cognitive paradigms (Shapiro et al. 2006).

Third, given that the present study was a cross-sectional design, causality cannot be concluded from the results. In fact, using pretest and posttest change scores to operationalise change in the mediator and the outcome variables is an important aspect of mediation (Kraemer et al. 2002). Hence, for a more accurate evaluation of mindfulness change process, longitudinal and experimental designs for assessing the same mediation effect of the current study are needed in further work.

The participants were not from a clinical sample, but from a university. Thus, it is uncertain whether the present findings could be generalised to clinical population. Also, the proportion of men in the study was relatively small, which renders the generalisation of the result to men problematic.

Finally, the present study was based on one-dimensional instruments of mindfulness. As it has been suggested that dispositional mindfulness has multiple facets involving observing, describing, acting with awareness and accepting without judgment (Baer et al. 2006), further study could explore which dimensions of mindfulness are more related to different aspects of mental health.

Conclusion

In conclusion, the present study tried to explain why mindfulness is effective at enhancing mental health from a cognitive perspective. Importantly, it provides initial evidence consistent with the previous notion that the benefit of mindfulness may be achieved through reducing negative cognition. The current findings also contribute to our knowledge regarding the effect of negative cognition on well-being. Although the limitations of the study necessitate caution as regards the results, it should provide enough stimulation for further research using an improved design to verify the present findings. Future, work should replicate and modify the present study design to reach a more persuasive conclusion.

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