Roles of Trait Mindfulness and Working Memory Capacity in Life Goal and Autobiographical Memory Specificities

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Abstract

Low life goal and autobiographical memory specificities are associated with negative psychological symptoms. Short-term mindfulness trainings can increase life goal and autobiographical memory specificities. The present study extends the literature by investigating whether trait mindfulness is associated with life goal and autobiographical memory specificities. Additionally, because mindfulness trainings improve working memory capacity, which is associated with future episodic specificity and autobiographical memory retrieval, a second aim of this study was to examine whether working memory capacity moderates the relationship between trait mindfulness and life goal and autobiographical memory specificities. 96 participants completed the Freiburg Mindfulness Inventory, Automated Operational Span task, minimal instructions Autobiographical Memory Test, and Measure to Elicit Positive Future Goals and Plans. A multiple regression analysis revealed that the presence aspect of trait mindfulness and the interaction of the acceptance aspect of trait mindfulness and working memory capacity were predictive for goal specificity. A follow-up simple slope analysis revealed that high acceptance aspect of mindfulness was associated with low goal specificity in participants with a high working memory capacity. However, this association was not present in participants with medium and low working memory capacity. Neither trait mindfulness nor working memory capacity were associated with autobiographical memory specificity. Findings suggest that present-moment awareness enables one to focus on accessing event-specific knowledge, and that an accepting attitude alone cannot help people with high working memory capacity to make more concrete and specific future plans. The lack of association between trait mindfulness and autobiographical memory specificity might be attributed to low specific memories found in this study.

Keywords: trait mindfulness, life goal specificity, autobiographical memory specificity, working memory capacity

1. Introduction

1.1 Goal Specificity

A goal can be defined as the thought of a desirable outcome that a person or group plans to achieve. Goals can be categorized based on hierarchal structures (Austin & Vancouver, 1996). The goals at the highest level are broad, abstract, and related to what a person wants to become in the future (e.g., a healthy person). Concrete and specific goals come under broad goals and comprise detailed actions and contexts (e.g., jogging on campus two times a week next month). According to goal-setting theory, when feedback on progress is provided, specific and difficult goals lead to better performance than easy or vague goals such as "just exercise more" (Locke & Latham, 2002). Contrary to the benefits of making specific goals, a lack of goal specificity is associated with negative psychological symptoms. Moreover, people who are prone to setting abstract goals often feel depressed and believe that their goals are unachievable (Emmons, 1992). Vincent, Boddana, and MacLeod (2004) reported that in comparison with controls, patients with a history of attempted suicide showed an equivalent number of goals, but these goals were considerably less specific.

1.2 Overgeneral Autobiographical Memory and Its Relation with Goal Specificity

The findings of Vincent et al. (2004) mirror the studies in which depressed patients are featured by overgeneral autobiographical memories (Sumner, Griffith, & Mineka, 2010; Williams & Scott, 1988; Williams, Teasdale,

Segal, & Soulsby, 2007). Comparable to Austin and Vancouver (1996)'s hierarchal view of goals, Conway & Pleydell-Pearce (2000) and Sumner (2012) argued that the autobiographical memory is also an organized hierarchy with lifetime periods at the top, followed by general events and then event-specific knowledge at the bottom and those with mental illness are less capable of moving down the hierarchy to retrieve specific details. Currently, there are findings suggesting that future-related imagination (or goals) and autobiographical memory retrieval share similar underlying processes. For example, low specificity in imagined future events has been associated with overgeneral memory (Maccallum & Bryant, 2011; Williams, Ellis, Tyers, Healy, Rose, & Macleod, 1996). Similarly, Belcher and Kangas (2013) reported that patients diagnosed with major depression without suicidal ideation produced fewer specific future goals and that the specificity of the goals was associated with that of autobiographical memory. The resemblances between future goal and autobiographical memory on behavioral measures are supported by the neuroimaging studies that demonstrated a neural overlap between remembering the past and imagining the future (Addis, Wong, & Schacter, 2007; Addis & Schacter, 2008). Based on their findings, Schacter and Addis (2007) proposed the constructive episodic simulation hypothesis, which suggest that episodic memories are extracted and reassembled to create simulations of future events.

Although autobiographical memory and future-goal planning share considerable similarity, they also have some substantial differences. For example, in addition to discovering the neural overlap between remembering the past and imagining the future, Addis et al. (2007) found that specific brain regions such as frontopolar, left ventrolateral, and right hippocampus were more active only during the construction of future events, but not during the retrieval of autobiographical memory. These differences may reflect the fact that when autobiographical memories are retrieved, individuals only need to recreate prior experienced events. However, in order to create hypothetical future goals, individuals need to combine episodic events and details in novel ways (Addis et al., 2007; Addis & Schacter, 2012).

1.3 Mindfulness

In order to reduce the negative consequences resulting from vague life goals and autobiographical memories, few studies have tried to utilize mindfulness-based training to increase the specificities of future life goals as well as autobiographical memories. The concept of mindfulness originated in the Buddhist tradition; the original Pali term of mindfulness is sati, which means "to bear in mind." From the 1980s, traditional mindfulness practices have been reformed for therapeutic use in medical settings (Kabat-Zinn, 1990; Segal, Williams, & Teasdale, 2002). Despite that the psychological constructs of mindfulness are not consistent cross studies (e.g., Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Baer, Smith, & Allen, 2004; Brown, & Ryan, 2003), scholars generally agree that mindfulness has two quintessential components: (1) self-regulation of attention, which is characterized by observing and attending to internal and external experiences on a moment-to-moment basis, and (2) an attitude of non-judgment and openness to the current experience (Bishop et al., 2004). Mindfulness can either be considered as a mental state achieved through practice, or a personal trait that indicates the degree or frequency a person stays in a mindful state on daily basis (Brown& Ryan, 2003). Although state mindfulness and trait mindfulness are different conceptually, they are not totally independent either; studies have suggested that the continual practice of mindfulness can lead practitioners from enhanced state mindfulness to elevated trait mindfulness (Kiken, Garland, Bluth, Palsson, & Gaylord, 2015; Quaglia, Braun, Freeman, McDaniel, & Brown, 2016).

1.3.1 Mindfulness Trainings Increase Goal and Autobiographical Memory Specificities

Williams, Teasdale, Segal, & Soulsby (2000) is the first of its kind to demonstrate that an eight-week course of mindfulness-based cognitive therapy can significantly enhance the specificities of autobiographical memories of individuals who had recovered from major depression. Williams et al. did not examine any possible mechanisms that could be responsible for the improvement of autobiographical memory specificities, but they suspected that mindfulness training may encourage participants to pay attention to their past experiences nonjudgmentally and, as a result, they would be less likely to abort the search process. This effect has been replicated by Heeren, Van Broeck, & Philippot (2009) with non-clinical samples. Additionally, Heeren et al. used a verbal fluency task to measure participants' cognitive flexibility. They found that cognitive flexibility partially mediates the effect of mindfulness training on autobiographical memory specificities; therefore, they proposed that the search for specific details requires mental resources, and enhanced cognitive flexibility allows participants to disengage attention from the general and engage focus on specific information in memories.

Crane, Winder, Hargus, Amarasinghe, and Barnhofer (2012) is the first study to examine the relationship between mindfulness intervention and life goals as well as autobiographical memory specificities. Depressive patients that participated in an eight-week course of mindfulness-based cognitive therapy significantly increased

the number of specific life goals. Additionally, the changes in their life goal specificities between pre- and post-tests were correlated with changes in autobiographical memory specificity. In terms of the underlying mechanism, the authors suggest that present moment awareness training reduced the participants' ruminative and abstract thinking and enabled them to evaluate their current state realistically and make concrete and specific goals.

1.4 The Present Study

The primary aim of the current study is to extend the investigation on the mindfulness training in Crane et al. (2012) by investigating whether and how trait mindfulness is associated with life goal and autobiographical memory specificities. One valid reason to conduct a trait mindfulness study is to discover which aspect of mindfulness is more related with life goal and autobiographical memory specificities. The essential constructs of mindfulness are: (1) paying attention to moment-by-moment experiences (i.e. presence); and (2) being non-judgmental and acceptive toward all experiences (i.e. acceptance; Bishop, 2004). In the current study, we examine these aspects of trait mindfulness to determine which one is more related with goal and memory specificities. Currently, as far as we know, no published study examines the relationship between trait mindfulness and future life goals. Therefore, if trait mindfulness acts on life goal specificities in the same direction as state mindfulness, we expect to observe that people with high trait mindfulness also have more-specific future life goals. Moreover, if Crane et al. (2012)'s interpretation about their findings is correct, perhaps only the present moment awareness of trait mindfulness is related with future goal specificities, but not the acceptance aspect.

Nevertheless, the same prediction may not be applied to the specificities of autobiographical memory, because there is an incongruence between mindfulness training studies (Crane et al., 2012; Heeren et al., 2009; Williams et al., 2000) and two trait mindfulness studies (Crawley, 2014; Mira, Campos, Etchemendy, Baños, & Cebolla, 2016) on autobiographical memory specificities. While all mindfulness training studies found increased autobiographical memory specificity after mindfulness training, Crawley (2014) used the Freiburg Mindfulness Inventory (FMI-14; Walach, Buchheld, Buttenmüller, Kleinknecht, & Schmidt, 2006) because it comprises the two aspects of trait mindfulness respectively and found that the presence aspect of trait mindfulness was negatively correlated with autobiographical memory specificity. According to Crawley (2014), the presence aspect of trait mindfulness is associated with high momentary self-awareness to extrinsic experiences during encoding, which leads to fewer elaborated thoughts when encountering cues during retrieval as well as less-specific memories. However, mindfulness trainings that focus on the acceptance aspect of mindfulness may reduce functional avoidance and increase executive control during retrieval, improving accessibility to specific knowledge. Moreover, Mira et al. (2016) did not show significant correlations between trait mindfulness and the numbers of specific autobiographical memories. Due to either the lack of research or the inconsistency among the findings, we believe that it is imperative to test whether and how trait mindfulness is related with life goal specificity and also to see whether the previous findings about autobiographical memory specificity can be replicated in the present study.

In addition to examining whether trait mindfulness is associated with life goal and autobiographical memory specificities, the secondary aim of this study is to explore the role of executive processes in the relationship between trait mindfulness and life goal and autobiographical memory specificities. Heeren et al. (2009) found that cognitive flexibility is partially responsible for the effect of mindfulness on memory specificity. Following the same logic, in this study, we investigated whether another executive function, working memory capacity, could also be involved with trait mindfulness and its relationship to life goal and autobiographical memory specificities. It has been shown that working memory capacity is associated with future episodic specificity (Hill & Emery, 2013) as well as semantic-autobiographical memory (Unsworth, Spillers, & Brewer, 2012). The relationship between trait mindfulness and working memory capacity is less consistent. Although Quickel, Johnson, and David (2014) did not observe significant correlation between trait mindfulness and digit span, visual graphic working memory capacity was found to be associated with trait mindfulness ($r = .48$) measured by the five facets mindfulness questionnaire (Li et al., 2021). Ruocco and Wonders (2013) found a trend of correlation ($r = .21$) between the awareness aspects of trait mindfulness and working memory capacity, as well as a significant correlation ($r = .31$) between the acceptance aspect of trait mindfulness and working memory efficiency (i.e. state working memory capacity) measured by N-back test. In the present study, we utilize Automated Operational Span (AOSPAN) task (Unsworth, Heitz, Schrock, & Eagle, 2005) to examine whether working memory capacity plays a role in trait mindfulness and its relationship to life goal and autobiographical memory specificities. We assume that working memory capacity could moderate this relationship.

2. Methods

2.1 Participants

This study enrolled 96 undergraduate students (81 males and 15 females) from a university in Taiwan. The students received course credits for their participation. The mean age was 19.5 years (range = 18 - 25; SD = 1.3), and none of the participants reported any diagnosed mood disorders.

2.2 Measures and Procedure

2.2.1 Chinese Version of Freiburg Mindfulness Inventory (FMI-14)

FMI-14 is a 14-item questionnaire that measures the presence aspect (e.g., I sense my body, whether eating, cooking, cleaning or talking) and acceptance aspect (e.g., I am able to appreciate myself) of trait mindfulness (Kohls, Sauer, & Walach, 2009; Walach et al., 2006). The English version of FMI-14 was translated into Mandarin Chinese by the second and third authors and revised and proofread by the first author of this manuscript. Participants were asked to rate how often (1 never to 4 very often) in the previous 30 days they had the experiences mentioned in the items. The Cronbach's alpha is .74 for the presence aspect and .81 for the acceptance aspect.

2.2.2 AOSPAN Task

The participants' working memory capacity was measured with the AOSPAN task (Unsworth et al., 2005), which comprises 75 trials of three sets for each set size, with the set size ranging from 3 to 7. In each trial, a math problem is presented on a computer screen. When a participant solves a problem, he or she clicks the mouse to view the answer and then decides whether it is the correct answer to the problem. A letter then appears on the screen for 800 ms. After the participant has completed the trials in a set, he or she needs to recall the given letters in the correct order. The total number of letters recalled correctly is used as the working memory capacity index.

2.2.3 Measure to Elicit Positive Future Goals and Plans (MEPGAP)

Life goal specificity was measured with the MEPGAP (Vincent et al., 2004), which is a semi-structured interview that is used to gauge a participant's capacity to set future life goals. The procedure used in this study is similar to that in Crane et al. (2012). First, the participants were asked to make as many goals as possible for the coming year in relation to each of the following six life-domain cues: home life, work/education, money, social life, close relationships, and health/fitness. The participants were given 60s for each domain. Goals were defined as "things that you would like to happen or things that you would like to be true of your life in the future" (Crane et al., 2012). The participants were then asked to review their goals and select the most imperative goal in each domain. The six selected goals for each participant were scored on a scale of 0 (nonspecific) to 3 (highly specific) according to the following criteria, and a participant's total score, ranged from 0 to 18, is used as the index of goal specificity. A goal that could be applied to several life domains was coded "0" (e.g., be assertive, cope better); a goal that indicated an action in one domain but required explanation was coded "1" (e.g., get slim, make new friends); a goal that indicated an action in one domain and was clear (did not require explanation) was coded "2" (e.g., go swimming, get my BA degree); and a goal was coded "3" when it specified an action in one domain and provided detailed information about when and how the action would be performed (e.g., meet with my advisor on Friday morning to discuss my thesis). Two independent raters calculated each participant's specificity scores. The correlation between each rater's ratings was 0.73 indicating that two rater's scores are quite consistent. For any discrepant scores between the two raters, the averages were used as the final scores.

2.2.4 Minimal Instruction Version of Autobiographical Memory Test (AMT)

The minimal instruction AMT, which comprises 12 emotional cues, was adopted to measure the participants' autobiographical memory specificity (Debeer, Hermans, & Raes, 2009). The cues were presented in a fixed order of alternating positive words (happy, proud, brave, confident, calm, and safe) and negative words (sad, guilty, ashamed, fear, anxious, and angry). The participants were given 30s to respond to each cue word with a specific personal memory. The memories could not be from the previous seven days or be a response to another cue. If no memory was recalled within 30s, the trial was recorded as an omission. The participants were not told that their memories had to be specific, and there were no practice items. The participants then self-classified their memories into three categories: specific (a memory event that happened at a specific time and place and lasted for less than a day), categoric (a memory that summarized several events), and extended (a memory of a period time that lasts longer than a day). An independent rater also coded the participants' memory events according to the same categories. Twelve percent of the memories are coded differently between independent rater and participants. We used the rater's classification to calculate the proportions of specific, categoric, and extended

memories, and the participants' self-ratings were used only as reference when the rater was unsure of a participant's memory event.

3. Results

3.1 Descriptive Statistics and the Correlation Analyses

Data were analyzed by using SPSS Statistics for Windows (Version 20.0). Table 1 presents the descriptive data of the FMI-14, life goal specificity, and proportion of different memory categories, and the correlations among these variables are presented in Table 2. Pearson's two-tailed correlations showed that the FMI_presence (the presence aspect of trait mindfulness) was positively correlated with the total AOSPAN total score (r = 26, p = .01) and life goal specificity (r = 29, p < .01), but not correlated with autobiographical memory specificity. Conversely, FMI_acceptance (the acceptance aspect of trait mindfulness) was not correlated with either the AOSPAN total score or life goal specificity, or with autobiographical memory specificity. Additionally, life goal specificity was significantly correlated with autobiographical memory specificity (r = 21, p = .05). We then examined whether trait mindfulness and AOSPAN total score predict life goal and autobiographical memory specificities and whether AOSPAN total score moderates the relationship between trait mindfulness and life goal and autobiographical memory specificities.

Table 1. Mean and SD for the FMI, Life Goal Specificity, and Proportion of Different Memory Categories

Variables	FMI_presence	FMI_acceptance	AOSPAN	Goal specificity	AMT_specific	AMT_categoric	AMT_extended
Mean	16.84	19.60	66.4	11.25	.48	.40	.12
SD	3.34	4.53	6.3	2.04	.18	.19	.13

Table 2. Correlations and p values (in parentheses) Between the FMI, AOSPAN, Life Goal Specificity, and AMT Specificity

Variables	FMI_presence	FMI_acceptance	AOSPAN	Goal specificity	AMT_specificity
FMI_presence					
FMI_acceptance	.63				
	(.00)				
AOSPAN	.26	.12			
	(.01)	(.26)			
Goal specificity	.29	.14	-.08		
	(.00)	(.20)	(.47)		
AMT_specificity	-.09	-.11	.12	.21	
	(.39)	(.28)	(.28)	(.05)	

3.2 Multiple Regression and Simple Slope Analyses

In the present study, we consider whether and to which extent trait mindfulness and working memory, as well as their interactions, could predict participants' goal specificity. Therefore, two enter method of multiple regression analyses were applied, one for life goal and the other for autobiographical memory. The first multiple regression analysis was conducted with life goal specificity as the dependent variable; and FMI_presence, FMI_acceptance, AOSPAN total score and the centered interaction terms, FMI_presence × AOSPAN_centered, and FMI_acceptance × AOSPAN_centered as independent variables. We used the centering method for interaction terms to reduce the problem of multicollinearity. The results of the regression analysis showed that the five predictors explained 15% of the variance (F(5, 90) = 3.2, p < . 05) and only FMI_presence (B = .24, β = .39, t = 3.06, p < . 01) as well as FIM_acceptance × AOSPAN_centered (B = −.02, β = −.28, t = −2.04, p < . 05) were significant predictors. This revealed that working memory capacity significantly moderated the association between the acceptance aspect of trait mindfulness and life goal specificity. The details of this model are presented in Table 3. To identify the effect of the acceptance aspect of trait mindfulness on life goal specificity at different levels of working memory capacity, we conducted a moderation analysis using SPSS Process based on Hayes (2018) with life goal specificity as the dependent variable, FMI_acceptance as the independent variable and AOSPAN total score as the moderator. FMI_presence and FMI_presence × AOSPAN_centered were set up

as the covariates. The results for the whole model and each predictor are the same as the aforementioned multiple regression analysis. The followed-up conditional effects of acceptance aspect of trait mindfulness on life goal specificity at low and high working memory capacity (1 SD below and above the mean) and medium working memory capacity are demonstrated in Figure 1. The simple slope analysis revealed that when the participants' working memory capacity was high, FMI_acceptance of trait mindfulness was negatively associated with predicted goal specificity (B = -.17, β = .08, t = -1.95, p = .05). However, this relationship was not present when working memory capacity was medium and low. The same multiple regression analysis was applied to autobiographical memory as the dependent variable; and FMI_presence, FMI_acceptance, AOSPAN total score and the centered interaction terms, FMI_presence × AOSPAN_centered, and FMI_acceptance × AOSPAN_centered as independent variables. However, neither the models nor the main effect and interactions reached significance.

Table 3. The regression coefficients

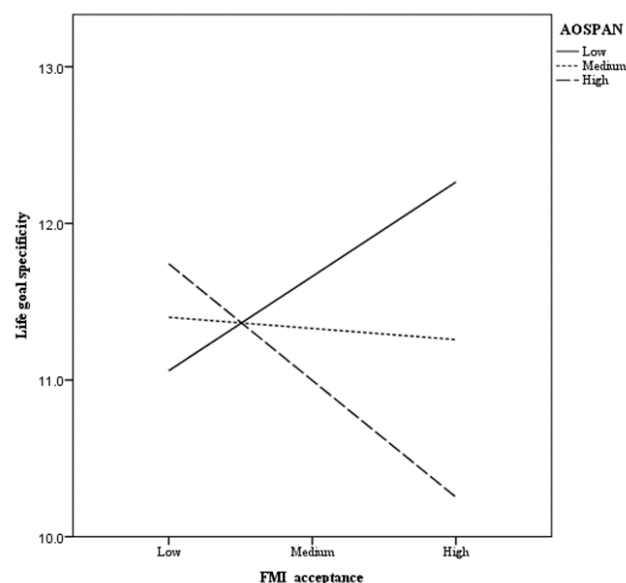|	Predicator	R^2	F	β	t
Model		.39	3.2**		
	FMI_presence			.39	3.1**
	FMI_acceptance			-.01	-.11
	AOSPAN			-.17	-1.7
	FMI_presence × AOSPAN_centered			.19	1.4
	FMI_acceptance × AOSPAN_centered			-.28	-2.0*

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

Figure 1. The correlation between FMI_acceptance and life goal specificity at different levels of AOSAPN total score

4. Discussion

The present study investigated the relationship between trait mindfulness and life goal and autobiographical memory specificities. We then examined whether working memory capacity moderates the relationship between trait mindfulness and life goal and autobiographical memory specificities. The results showed that the presence aspect of trait mindfulness was positively correlated with and acted as a significant predictor for life goal specificity. Present-moment awareness is known to help people focus on a target task in a moment without mind wandering (e.g. Cheyne, Carriere, & Smilek, 2006; Cheyne, Solman, Carriere, & Smilek, 2009; Mrazek, Smallwood, & Schooler, 2012). For instance, Mrazek, Smallwood, and Schooler (2012) utilized the Mindful Awareness Attention Scale, a single construct scale that measures the present awareness aspect of mindfulness, and found that a high level of trait mindfulness was associated with fewer task-unrelated thoughts during a breath mediation task as well as fewer errors and lower response-time variability during the Sustained Attention

to Response Task. Moreover, the observing facets of mindfulness (referred to as attending to experiences) measured by the five facets mindfulness questionnaire were associated with distraction control during reading (Gorbovskaya, Park, & Kim, 2014). In summary, the reason that present-moment awareness has a direct effect on goal specificities is perhaps because present-moment awareness helps a person reduce task unrelated thoughts and direct his or her attention on accessing the autobiographical knowledge of each domain in the self-memory system to generate specific goals.

Moreover, the acceptance aspect of trait mindfulness was not directly associated with life goal specificity, but the interaction of working memory capacity and the acceptance aspect of trait mindfulness predicted life goal specificity. When the participants' working memory capacity was high, high FMI_acceptance was associated with low life goal specificity; however, this relationship disappeared when working memory capacity was medium and low. These findings are unexpected because an acceptive attitude acts as a crucial key that enables patients with post-traumatic stress disorder to retrieve miserable memories without avoidance (Lang et al., 2012) and a recent neuroimaging study also indicates that being in the acceptive state is associated with not automatically reacting to autobiographical memory (Fujino, Ueda, Mizuhara, Saiki, & Nomura, 2018). Therefore, based on the abovementioned research, it is more likely that the acceptance aspect of trait mindfulness would enable people to access event-specific knowledge. For the time being, we propose a possible explanation for this unexpected effect. In the current moderation analysis, FMI_presence and FMI_presence × AOSPAN_centered were treated as covariates, so the moderation effect represented the unique contribution of acceptance aspect of trait mindfulness and working memory capacity to life goal specificity while the presence aspect of trait mindfulness was controlled. Additionally, people with high working memory capacity tend to generate more spontaneous future thoughts (Baird, Smallwood, & Schooler, 2011). Combining these two pieces of information, we speculate the reason that acceptance aspect of trait mindfulness lessens life goal specificity in participants with high working memory capacity is because these individuals generate too many spontaneous thoughts about the future, but having too many thoughts in mind at once without focusing may hinder their efforts to make concrete plans to achieve these goals.

Neither the presence nor acceptance aspects of trait mindfulness were significantly correlated with autobiographical memory specificity. This lack of correlation was not congruent with the trait study by Crawley (2014) or the treatment outcome studies (Crane et al., 2012; Heeren et al., 2009; Williams et al., 2000). This inconsistency may be due to two reasons. First, we used the minimal instruction version of the AMT, not the traditional instruction version. The difference between them is that in the traditional instruction version, participants are explicitly instructed to generate one specific memory in response to each cue word, and each memorized event should happen on a particular day. However, in the minimal instruction version, participants are told to generate memories in regards to the cue words, without emphasizing that these memories should be specific (Debeer et al., 2009). Debeer et al. (2009) reported that participants generated less-specific memories using the minimal instruction than using the traditional instruction. Therefore, the low specific memories generated in the minimal instruction group may constrain the association between memory specificity and trait mindfulness. However, this interference is unlikely because Debeer et al. (2009) also found that specific memories in a minimal instruction group were sensitive enough to be associated with the participants' degree of depression and rumination.

The second and more plausible explanation is related to cultural differences. We noticed that the proportion of specific memories in this study (.48) was considerably smaller than that reported in Williams et al. (2000) (in a pretest: .70 in a treatment as usual group and .72 in a mindfulness-based cognitive therapy group) and in Crawley (2014) (.68). This difference is in line with the findings by Baird et al. (2011), who reported that Asians recalled fewer personal episodic events than did European-Americans at different retrieval intervals, even though both groups showed similar forgetting rates over time. Moreover, the third study by Wang (2009) showed that Asians perceived fewer discrete events than did European-Americans when reading one paragraph of narrative text. The researcher suggested that Asians, in comparison with European-Americans, view the passage of time as a combination of fewer separated events and consequently retrieve fewer episodes. Applying this finding to our study, the lower specific memories generated by our Asian participants may have constrained the extent of the association between their specific memories and trait mindfulness. However, this interpretation requires future research to examine.

Finally, in accordance with Belcher and Kangas (2013), a significant correlation between life goal and autobiographical memory specificities was observed, even though the magnitude of the coefficients was smaller in our study (.21) than in theirs (.41 for depressed patients and .44 for non-depressed patients). One plausible reason for this discrepancy relates to how future events were measured. Belcher and Kangas (2013) used the

future imagination task, a mirror version of the AMT, to measure future imagination specificity. The instructions and coding procedures between the future imagination task and AMT are the same, except that participants have to generate future events in the future imagination task and past events in the AMT. Therefore, it is possible that the similarity in the task procedures inflated the correlations. If this interpretation is true, our study may offer a unique support to the commonality between thinking about past and future events after the potential confusion of methodological similarity has been removed.

4.1 Limitation, Conclusion and Future Direction

This study has several limitations. First, this is a correlational study. Consequently, even though plausible mechanisms and explanations for the observed associations have been presented, further research is required to confirm the underlying mechanisms of these associations. However, our findings are imperative because this is the first study to report the relationships between trait mindfulness, life goal specificity, and working memory capacity. Second, self-reported measures were used in the current study. Therefore, it is unclear whether these self-reported measures truly captured the constructs of the participants' trait mindfulness, life goals, and autobiographical memories, and whether the rating processes were truly free from bias. Nevertheless, the FIM-14, AMT, and MEPGAP are established measures. Applying the same widely used measures in our study facilitates comparison between related studies. Another limitation is the choosing of FIM-14 to measure trait mindfulness. FIM-14 was chosen because it catches the two most essential constructs of mindfulness. However, what constructs should be included in trait mindfulness are inconsistent across studies (e.g., Baer et al., 2006; Baer, Smith, & Allen, 2004; Brown & Ryan, 2003). Therefore, using another multi-construct scale, such as the five facet mindfulness questionnaire, may give us a more complete picture of the relationship between trait mindfulness, life goal and autobiographical memory specificities. Additionally, the Cronbach alpha value for the presence aspect (.74) is at an acceptable level, but lower than preferred level (Cortina, 1993), which may potentially limit our theoretical inference.

In conclusion, this study extends the previously mentioned treatment outcome studies into a trait study with a nonclinical sample, and is the first to demonstrate that a person's presence aspect of trait mindfulness is predictive of his or her life goal specificity. Moreover, the acceptance aspect of trait mindfulness may cause people with high working memory capacity to make fewer specific life goals. Although the underlying mechanisms have been proposed, future research is needed to confirm the causal interferences, because this is a correlational and explorative study.

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