

The Relationship Between Wandering Mind, Depression and Mindfulness

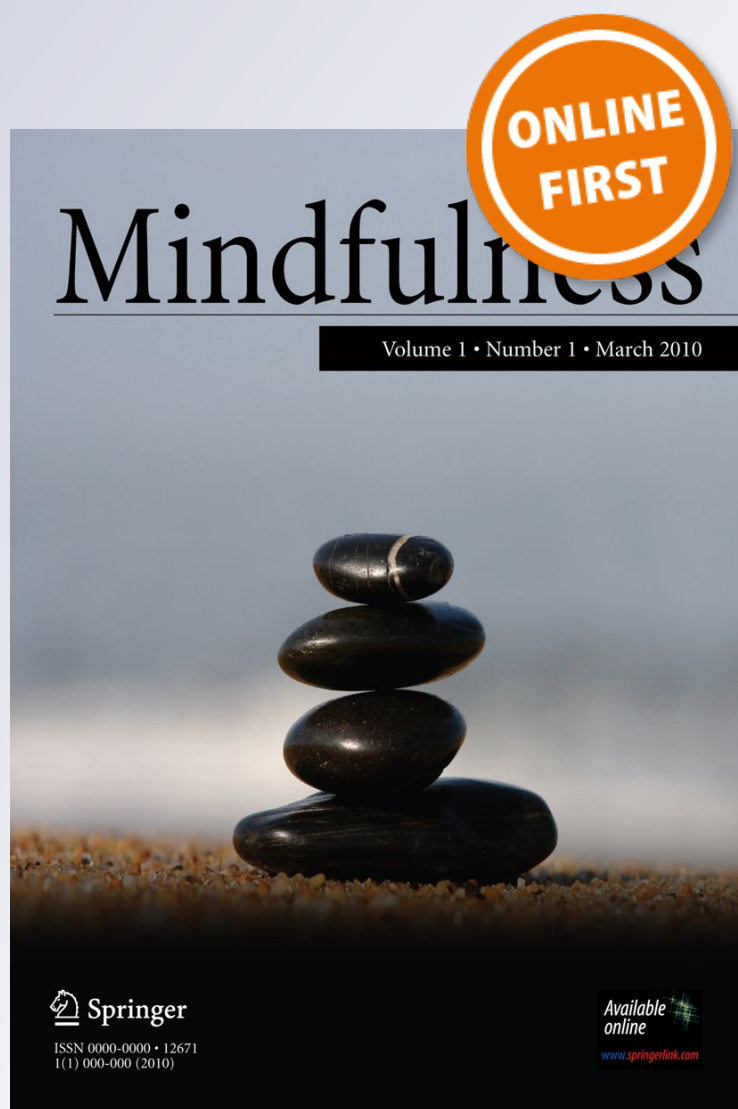
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The Relationship Between Wandering Mind, Depression and Mindfulness

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Abstract This study examined the relationship between wandering mind, depression and mindfulness. We used the Sustained Attention to Response Task to assess the wandering mind, while the online thought probes were employed as the subjective marker for mind-wandering. The Beck Depression Inventory and Mindfulness Attention and Awareness Scale were used to assess depression and dispositional mindfulness respectively. The results revealed that the wandering mind even without awareness was not only positively associated with depression, but also negatively related to dispositional mindfulness. Depression was negatively related to dispositional mindfulness. These results might provide evidence that a wandering mind is positively associated with depression and mindfulness.

Keywords Mind-wandering · Depression · Mindfulness

Introduction

A wandering mind refers to the spontaneous mental activity that turns attention from a primary task to the processing of irrelevant information (Smallwood and Schooler 2006). A wandering mind may help adaptation (Baars 2010). However, there are close relations between mind-wandering and depression (Watts and Sharrock 1985). In a pioneering study, Watts and his colleagues demonstrated that wandering mind was positively correlated with the severity of depression (1988).

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Other researchers have also found that task-unrelated thoughts were associated with depression (Obsonsawin et al. 2002; Smallwood et al. 2005), and mind-wandering was positively correlated with dysphoria (Smallwood et al. 2007b). Negative mood contributes to the elevation on wandering mind (Smallwood et al. 2009). This evidence implies that a mood state (negative affect) activates negative thinking and increases the possibility of depressive relapse (Teasdale et al. 2000). In a word, a wandering mind leads to an unhappy mind (Killingsworth and Gilbert 2010).

Mindfulness refers to focus on the present internal and external experience with non-judgmental and non-response attitudes (Williams 2008). Mindfulness could help the individuals to give up depressive rumination and cultivate the mindful mode of response (Teasdale et al. 2000; Williams 2008). Increasing evidence has demonstrated that mindfulness-based interventions can effectively improve positive emotion and reduce depression in both clinical and nonclinical populations (Hofmann et al. 2010; Smallwood and Schooler, 2006; Tang et al. 2007; Teasdale et al. 2000; Williams 2008).

To date, there has been little work examining the relationship between wandering mind and mindfulness. Cheyne et al (2006) found that attention-related cognitive errors scale (ARCES) was associated with the Mindful Attention Awareness Scale (MAAS) and with error rate in the Sustained Attention to Response Task (SART). The MAAS also shows a strong relationship with errors and reaction time in SART (Cheyne et al. 2006) and thus attentional lapses may contribute to the affective well-being (Carriere et al. 2008). However, no self-reports about subject's present psychological state during the behavior tasks was provided in the Cheyne et al. (2006) study and they used MAAS as a measure of one's tendency to attention lapses. Actually, MAAS as self-report measures was developed to assess the individual's frequency and strength of mindfulness (Brown et al. 2011a, b, 2012; Brown and Ryan 2003). In our study, we

further use MAAS and SART to directly explore the relationship between wandering mind and mindfulness.

The Cheyne et al. (2006) study used the method of experience sampling to assess the participants' aware/unaware mental states by intermittently self-reporting of whether or not they were aware of mind-wandering during the performance of a demanding task. Accordingly, the individuals' mental states were categorized into one of the three kinds: "on-task", "tuned out" (mind-wandering with awareness), or "zoned out" (mind-wandering without awareness). These three mental states contributed to the differences in individuals' performance and neurocognitive activity (Christoff et al. 2009; Smallwood and Schooler 2006; Smallwood et al. 2007a, 2008a, b, c). Zoned out was associated with poorer response inhibition (Smallwood et al. 2007a, 2008c) and mental models (Smallwood et al. 2008c) compared to tuned out. Smallwood et al. (2008b) observed the smaller P300 amplitude during stimulus-activity following self-reported mind-wandering than during "on-task" state. Both default and executive network regions were active during mind-wandering and the neural activation in these regions was strongest when participants were unaware of mind wandering (Christoff et al. 2009). Thus, the performance and brain activity of these three mental states (on-task, tuned out, or zoned out) are quite distinct.

In summary, there exist several close and complex relationships among wandering mind, depression, and mindfulness. While previous studies have investigated the relationships between wandering mind and depression, and of mindfulness and depression. Little study has put the three variables together and examined the comprehensive association between all three of them.

Hence, in the present study, SART was used and thought probes were provided as the behavioral and subjective assessments of the wandering mind. The Beck Depression Inventory (BDI) and Mindfulness Attention and Awareness Scale (MAAS) were employed to measure depression and dispositional mindfulness. The hypotheses were that mindfulness would have the negative association with wandering mind without awareness and with depression. Wandering mind without awareness would strongly and positively relate to depression. Wandering mind with awareness would show no association with mindfulness and depression.

Method

Participants

Twenty-three healthy students (12 males, mean age 21.9, $SD=1.6$) from Dalian University of Technology were recruited to attend the related experiments.

Procedure

The first step in the procedure was to ask the participants to finish the MAAS and BDI. Then they performed the behavioral experiment on wandering mind.

Measures

The MAAS is a self-reported assessment consists of 15 items rated on a six-point Likert scale from 1 (almost always) to 6 (almost never). The total score of the 15 items assesses what extent the respondents pay mindful attention to and are aware of the present experience (Brown et al. 2011a, b, 2012; Brown and Ryan 2003). It had shown the sound psychometric property in Brown's study. Moreover, we investigated the Chinese translation of the instrument and found that the Chinese-version MAAS is also a sound measure with high internal consistency (Cronbach's $\alpha=.85$) and acceptable test-retest reliability ($r=.54$; Deng et al. 2011).

The BDI (Beck 1967) containing 21 items was first developed by Beck to measure the intensity, severity, and depth of depression. The split-half coefficient of the Chinese version of BDI is .879 and Cronbach's alpha .890. BDI is indicated good construct and concurrent validities for its individual items and the whole scale as well in China (Zhang et al. 1990). Here, BDI was used to assess depression symptoms.

The Sustained Attention to Response Task (SART) was used to assess the behavioral wandering mind, while the thought probes were employed to get the subjective reports of mind-wandering (Christoff et al. 2009; Robertson et al. 1997; Smallwood et al. 2008a). The SART consisted of 480 stimuli, which were 52 targets (about 11 % of trials) and 428 nontargets. The target was the Arabic number 3, and the nontargets were the number 0 to 9 except 3. Each stimulus would present for 750 ms, and the interstimulus interval was 1,250 ms. There were 16 blocks in the SART. To prevent guessing the targets, in each block, the targets and nontargets were pseudocounterbalanced with the restriction that (1) a minimum of one and a maximum of two targets, and (2) 15 to 45 stimuli within each block were distributed. Except the block with 45 stimuli, other 15 blocks were randomly presented. At the end of each block, the thought probe was presented to the participants and asked them two questions. First, "did you focus on the task just now?" If the participants answered "No.", then the second question would ask the participants, "were you aware that you did not pay attention to your task just now?" The two questions could categorize the participants' mental state during the experiment into three types: on-task, tuned out (mind-wandering with awareness), or zone out (mind-wandering without awareness) (Christoff et al. 2009; Robertson et al.

1997; Smallwood et al. 2008a). The whole experiment lasts about 16–20 min.

Results

The average error rate of targets across the participants in SART was employed as a behavioral index of the strength of the wandering mind. In the thought probe, the tune-out rate and the zone-out rate were used as subjective indices of the wandering mind. The total scores of all the items in MAAS represented mindfulness and the BDI score represented strength of depression. The means and standard deviations as the indices of wandering mind, mindfulness, and depression are shown in Table 1.

We used Pearson's correlation coefficient to analyze the relationship between wandering mind, mindfulness and depression. These results are shown in Table 2.

Error rate of targets in SART was negatively correlated with negative association with mindfulness (MAAS). The on-task rate from the thought probes was significantly negatively associated with the tune-out rate, zone-out rate, and BDI as well as positively related to MAAS. Furthermore, the MAAS and BDI showed strong negative relation, while the zone-out rate and BDI showed a positive relationship.

In addition to these significant correlations, the correlation between the zone-out rate and MAAS showed marginal significance with $p=.050$, and the correlation between target error rate and zone-out rate was also marginal with $p=.062$.

Discussion

The current study provided evidence to clarify the relationship between wandering mind, mindfulness, and depression. The on-task rate positively related to MAAS and negatively associated with the tune-out rate and zone-out rate. This indicated that individuals who focus on their present task are more mindful and apply less and less attentional resources to process task-unrelated-thoughts. In previous studies,

Table 1 Means, standard deviations for wandering mind, mindfulness, and depression

	Mean	SD
Error rate of target	0.23	0.16
On-task rate	12.43	2.41
Tune-out rate	2.83	2.12
Zone-out rate	0.74	0.96
MAAS	4.58	0.59
BDI	6.22	5.14

Table 2 Correlation between wandering mind, mindfulness, and depression

	On-task rate	Tune-out rate	Zone-out rate	MAAS	BDI
Error rate of target	-.276	.134	.395	-.452 ^a	.159
On-task rate		-.917 ^b	-.478 ^a	.440 ^a	-.415 ^a
Tune-out rate			.088	-.312	.278
Zone-out rate				-.412	.425 ^a
MAAS					-.808 ^b

^a Correlation is significant at the .05 level (two tailed)

^b Correlation is significant at the .01 level (two tailed)

participants induced with more negative mood were prone to experience wandering mind (Smallwood et al. 2007a, b, 2009). The current study, which showed BDI reversely related to the on-task rate, confirmed these results.

In the thought probe, the zone-out rate showed strongly association with BDI but the tune-out rate and BDI were not related. Furthermore, behavioral measure of attention lapse, the error rate of target in SART, was marginally related to zone-out rate but not strongly related to tune-out rate.

In our study, MAAS was inversely correlated to error rate of target, zone-out rate and BDI, and was positively related to on-task rate. Therefore, as a self-report scale to assess mindfulness, MAAS was strongly associated with the mind-wandering measures and could use it to identify the individual difference of mindfulness (Davidson 2010). It also provided evidence to support that higher quality of consciousness helps individuals to promote self-regulation of negative emotion (Brown and Ryan 2003). In other words, our "stolen mind" may be compensated by mindfulness-based training.

In the thought probe, the tune-out rate showed no relationship with error rate of target, zone-out rate, MAAS, and BDI. That is because tune-out refers that the participants are aware of where their mind drifted away just now, and the moment when participants are catching mind-wandering, they are conducting the metacognitive process (Smallwood and Schooler 2006). In fact, meta-awareness is the basic skill in the mindfulness-based training. For instance, in the mindfulness-based cognitive therapy (Teasdale et al. 2000; Williams 2008), the participants learn to increase the awareness of the ongoing situation and to reduce the automatic modes of cognitive-affective processing. In this way, the individuals gradually cultivate to accept their present experience and are less depressed. Of course, the non-relationship between tune-out rate and MAAS might further indicate that wandering mind with awareness does not equal to the state of mindfulness, which refers to the body-mind

balance without striving thought and emotion (Tang and Posner 2009).

These results led us to infer that individuals who were not aware of their present situation were more likely to shift their attention resources towards their inner processing, and less likely to focus on targets. They may also mean that the wandering mind without awareness results in activating automatic processing and inducing more negative mood. Since depressive individuals also tend to engage in more automatic and negative processing, they increase the frequency of wandering mind (Williams 2008). To some extent, depression, wandering mind, and attention lapses without awareness share similar processing mechanisms.

Finally, limitations in present study and possible directions for future research should be taken into consideration. First, since the present research was a pilot study and used relatively small sample of healthy undergraduates, a larger sample should be used for further replication. Second, our preliminary study provides important evidence of the relationship between wandering mind, depression, and mindfulness. Other methods such as neuroimaging and physiological measures should be employed to explore the underlying mechanisms and the relationships between wandering mind, depression and mindfulness.

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