

Mindfulness as a Mediator Between Mind-Wandering and Creative Abilities

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Abstract: In this study, the integrated roles of mind wandering (MW) and mindfulness on creative thinking were explored even though these have been regarded previously as separate and antithetical constructs. The current study attempted to refute this notion that mindfulness sit on one end of a spectrum apart from which mind-wandering sits opposite. Instead, it argued that mind-wandering is a core human state, and that healthy human functioning sits in the balance between MW and mindfulness. **Objective:** The study hypothesized that mindfulness mediates the relationship between MW and creative abilities (fluency, flexibility, originality and maintenance of direction). In particular, MW was analyzed in the light of a recent approach that posits a differentiation between deliberate and spontaneous MW. Mindfulness was analyzed by means of distinguishing its five different constitutional dimensions: observing, acting with awareness, describing, non-reactivity, and non-judging. **Materials and methods:** The participants comprised 321 undergraduate students aged between 18 and 23 years and enrolled at Cairo and Helwan universities in Egypt. The participants completed deliberate and spontaneous MW questionnaires, a mindfulness questionnaire, and subscales from the Arabic version of Guilford's creative thinking battery and Torrance's creative thinking battery. **Results:** The results revealed that mindfulness partially mediates the relationship between deliberate MW and creative abilities—namely, verbal and figural fluency, verbal flexibility, and maintenance of direction—whereas it completely mediates the relationship between deliberate MW and figural flexibility. However, mindfulness did not mediate the relationship between spontaneous MW and creative abilities.

Keywords: Deliberate Mind Wandering, Spontaneous Mind Wandering, Mindfulness, Creative Abilities

1. Introduction

Mind wandering (MW) may be defined as the occurrence of stimulus independent and task-unrelated thoughts [30, 26, 29]. As one of the most universal mental activities [22], MW consumes a considerable proportion (15%–50%) of thinking time when one is working on a particular task. On average, 30% of individuals' cognizant experiences constitute MW [13, 22].

Several studies have revealed that MW is associated with negative outcomes, for example, a reduction in both executive control—that is, working-memory capacity—[41, 17, 31, 42] and attentional control abilities [11, 44]. However, in the last decade, a growing body of research has demonstrated that MW may also entail a valuable cognitive capacity. Furthermore, several adaptive properties of MW

have been identified. For example, MW may be important for many other mental functions, including the delay of discounting [35] and problem-solving abilities [32].

There are two perspectives regarding the relationship between MW and creativity. The first perspective suggests that MW is positively correlated with creativity because it facilitates the formation of novel associations and the recombination of mental images, which can constitute a source for creative ideas. The recombination of mental images may be attributed to the fact that during MW, an individual's imagination is relatively undisturbed by environmental stimulation [45, 39, 28, 43, 46]. The second approach suggests that MW may be negatively correlated with creativity because performances on divergent and convergent creative tasks are adversely affected by the lack of focus during MW [13, 10].

Studies may have yielded inconsistent results related to the relationship between MW and creativity for several reasons. First many studies have not indicated the types and levels of MW that either enhance creative abilities or inhibit them. To the best of our knowledge, only one study has revealed that the optimal level of deliberate MW facilitates creative abilities; it suggests that this is because individuals engage in it deliberately, thus enhancing their processes of control over their cognitive activities. On the contrary, the study further revealed that a high level of automatically occurring mental wandering may inhibit individuals' creative performance [1].

Second, some researchers have suggested that studying MW in isolation, that is, without referring to its interaction with other co-occurring mental states while individuals perform their tasks, may lose its relevance [41]. Some studies have demonstrated that "mindfulness"—which refers to a state of conscious, sustained, and focused awareness resulting from a nonjudgmental attention to the present moment—is a mental state instrumental in the achievement of an optimal level of MW [6, 1].

The literature review revealed that for a long time, MW and mindfulness had been considered inversely related phenomena [e.g., 23, 4]. This assumption has also been adopted in studies on the effect of MW on creative thinking [e.g., 3, 19, 18]. Nonetheless, recent evidence has indicated that two different types of MW, namely, spontaneous and deliberate MW, are uniquely associated with certain dimensions of mindfulness [33]. Conflating the two sorts of MW similar to the classification of the various dimensions of mindfulness would probably lead to underspecified or frustrated and misdirected ends [1].

Some researchers [2] have argued that MW is a core human capacity and that healthy human functioning entails a balance between spontaneous thought and deliberate meta-cognition. Therefore, the pertinent question is not how individuals can employ mindfulness to rid themselves of MW; rather, it is whether these mental states can interact with each other to enlighten individuals' thinking in general and creative thinking in particular.

Justo, Manas, and Ayala proposed that mindfulness is not the only way to increase creative abilities; rather, its role is limited to enhancing some abilities such as creative fluency and flexibility, which require analytical thinking. In such cases, mindfulness helps individuals focus on their interests in the current tasks and, subsequently, monitor the nature of associated ideas. This activity helps one determine, without judgments, what motivates them to generate such ideas flexibly [15].

On the contrary, MW facilitates the enhancement of other creative abilities, the most important of such abilities being originality, which requires more of free thinking compared to analytical thinking. In order to achieve optimal cognitive performance, it is imperative to strike a balance among MW, reasoning, and an awareness of each task's requirements [21, 5].

To the best of our knowledge, only one study has explored the synergic role of MW and mindfulness dimensions on

creative thinking [1]. The results revealed that MW and mindfulness dimensions predicted creativity. In particular, while deliberate MW positively predicted creative performance, spontaneous MW was negatively associated with such. Moreover, with regard to the non-reactivity and awareness dimensions of mindfulness, the latter in interaction with deliberate MW emerged as main predictors of response originality.

Research has not examined the need to distinguish between spontaneous and deliberate MW. One of the pertinent questions in this regard is whether spontaneous and deliberate MW contribute to creative thinking differently. Furthermore, one may question whether the two kinds of MW interact differently with mindfulness in relation to their effect on creativity.

2. Literature Review

2.1. Mind Wandering (MW)

Since the start of the 21st century, there has been a resurgence of scientific interest in the study of self-generated mental activity or MW [see 36], thus reflecting a dramatic change in psychological research from the exclusive concentration on the gate of thought and behaviors [37]. In fact, this delay in the study of MW has been attributed at least partially to the predominance of behaviorism in psychological research in the second half of the 20th century. Favoring the advantages of this approach led prominent senior psychologists and prestigious journals to show contempt for the subject [26]. Consequently, it has been argued that emphasis on examining external tasks has contributed to incorrect assumptions about self-directed mentoring [37, 26].

Since 2006, the use of the term MW, which distinguishes it from other overlapping terms, has increased at an unprecedented rate [26]. Previously, many terms such as absence of the mind, attention distraction, and daydreaming were employed to express the concept of MW because it automatically distracts an individual from the current task and focuses on other topics that are not related to that task. However, these terms did not provide an in-depth explanation of mental wandering [20]. Researchers concluded that although individuals deliberately engage in MW at times, it can occur naturally and does not necessarily indicate that an individual's cognitive abilities have failed. Consequently, researchers started to use a different term that expresses the nature of this mental state more accurately [34].

MW occurs when an individual's attention shifts from the current task or external environment to internal thoughts such as memories and prospective thoughts unrelated to the task [30, 26, 29, 36]. There are two types of mind wandering: spontaneous mind wandering and deliberate mind wandering [8]. In the former, thoughts that are unrelated to the task attract attention, causing an uncontrolled shift from the task at hand to other thought channels. However, in deliberate MW attention is shifted consciously from the focal task

toward internal thoughts [8, 34].

Although MW is still being studied, the theoretical foundations are largely inconsistent and experimental methods still being developed on the same. Nevertheless, some key principles have begun to emerge. Theoretical models of mental wandering often involve an executive control system that is believed to control a number of higher-level cognitive processes related to the initiation and maintenance of non-task-related thoughts, including the direction of attention and the creation of new answers or solutions [27].

Among the existing theoretical models, there are four hypotheses on mind wandering, each of which capture different views on the phenomenon and many of which are based on the executive control system [26]. First, the (perceptual decoupling) hypothesis assumes that the executive control system in MW allows these mental processes to become uncoupled from the external environment, thus reducing attention to the external environment and maintaining an uninterrupted internal chain of thought [20, 26, 34].

Second, the *executive failure* hypothesis implicates the executive control system in ramblings of thought; however, it expands the role of this system beyond perceptual decoupling. It is specifically thought to reduce external and internal distractions to draw attention to primary thinking. Thought distraction occurs when the executive control system does not inhibit distracting internal thoughts. In other words, this hypothesis classifies MW as an involuntary failure of our cognitive system [29].

Third, the *current concerns* hypothesis focuses on why MW occurs on a large scale. It assumes that individuals' goals and desires trigger MW by distracting attention from the current external environment. This mindset can work in conjunction with the more mechanistic hypotheses noted previously, in which relevant personal concerns divert attention from external stimuli because the executive control system is unable to sustain external attention [27, 26].

Fourth, the *resource control account hypothesis* clearly posits that MW is not necessarily a failure of, but a phenomenon inherent in, our cognitive system. The most recent report on resource control clearly suggested that wandering thinking is a standard state of our cognitive system. This report further argued that both MW and attention to external tasks are based on a limited set of resources [34]. Similar to the executive failure hypothesis, the resource control account hypothesis involves an MW executive control system. This assumption suggests that the executive control system allocates limited resources to both MW and on-going tasks to realize optimal performance. However, with time, the executive control system becomes exhausted and is less able to prevent the default state, thus leading to MW and inferior task performance [30, 27].

2.2. Mindfulness

In psychology, early interest in meditation began to emerge

as early as the 1950s when meditation and Yogic meditation began occupying a prominent place in Western cultures [25]. It is thought that although Jung primarily employed meditative symbols, he may have been the first psychologist to develop a strong interest in meditation earlier than the 1950s. However, in the 1950s and 1960s, a number of psychotherapists began to harbor an interest in meditation in general and Zen meditation in particular [19].

Mindfulness refers to a state of conscious, sustained, and focused awareness resulting from nonjudgmental attention to the present moment [6]. Mindfulness is a multifaceted construct comprising different components and skills, including the ability to: i) pay attention to different stimuli (observing); ii) focus attention consciously (acting with awareness); iii) describe feelings and beliefs verbally (describing); iv) not react to internal experiences (being nonreactive); and v) not to evaluate experiences (not judging) [1].

2.3. Creative Abilities

Creativity may be defined as the ability to express oneself freely, without inhibitions, limitations, and worries. It also involves preparing oneself to function at maximum capacity, without self-consciousness. This ability develops throughout individuals' lives and is context-dependent. Their creative capacities can only develop within the limits of their maximum creative potentials and in optimal circumstances [9].

In conclusion, fluency may be explained as the generation of multiple problems, ideas, alternatives, and/or solutions [16]. Flexibility is the ability to process ideas or objects using the same stimulus but in different ways. Furthermore, it involves discarding old ways of thinking and moving in different directions [16, 12]. Originality comprises moving away from the obvious and mundane as well as divorcing oneself from conventional wisdom. Statistically, initial ideas are rare. Originality is a creative drive or a spiritual leap from the obvious. Original ideas are often described as surprising, wild, unusual, new, strange, remarkable, and/or revolutionary [12]. Maintenance of direction encompasses the ability to focus long-term attention on a specific goal despite the presence of distractions that may abound in the form of external situations or as a result of the modifications that have occurred in the attainment of a particular goal. Maintenance of direction thus entails flexibly circumventing any distractions [40].

3. Methodology

3.1. Sample

The participants comprised 321 undergraduate students aged between 18 and 23 years (72% females: mean age = 19.47 years, SD = 1.07; 28% males: mean age = 19.51 years, SD = 1.54) who were enrolled at the Cairo and Helwan Universities in Egypt. Each participant completed was administered a series of questionnaires and creative thinking tests.

3.2. Tools

3.2.1. Mind Wandering Questionnaire (MWQ)

Developed by Mrazek, Phillips, Franklin, Broadway, and Schooler [24], the MWQ measures spontaneous mind wandering as a state. The MWQ defines MW as “the interruption of task focus by task-unrelated thoughts” [24]. The measure comprises five items that have been translated into Arabic. The five items are evaluated on a 5-point Likert scale, ranging from 1 (never or very rarely true) to 5 (very often or always true). The scores of the five items are totaled to obtain an aggregate MWQ score. The measure is reported to have good reliability (measured via test-retest and Cronbach’s alpha) and construct validity (measured through confirmatory factor analysis) (Table 1).

3.2.2. Deliberate Mind Wandering Scale (MW-D)

The MW-D scale measures deliberate MW as a state [7]. The scale provides a unique measure of MW as an “intentional or deliberate shift in attention toward internal thought” [7, 6]. The scale, after being modified and translated into Arabic, comprises four items, which are assessed on a 5-point Likert scale, ranging from 1 (never or very rarely true) to 5 (very often or always true). The scale is reported to have good reliability (test-retest and Cronbach’s alpha) and construct validity (confirmatory factor analysis) (Table 1).

3.2.3. Thought Probes

During the creative thinking tasks, the participants were periodically presented with thought probes, which required them to classify their immediate preceding thoughts. The participants were asked to choose one of four answers to describe what they had been thinking immediately prior to the presentation of the probes. Specifically, they were presented with two probes and first asked to characterize their current conscious experience. The four possibilities included: i) I am totally focused on the current task; ii) I am thinking about my performance on the task or how long it is taking; iii) I am distracted by information present in the room (sights and sounds); and iv) I am zoning out/my mind is wandering. Second, the participants were asked to select one of two current conscious experiences, namely, wandering spontaneously and deliberately engaging in mental

wandering.

The participants received specific instructions for the different categories. Similar to previous research and in relation to what they had been thinking immediately prior to the presentation, the first response was classified as task-focused thinking; response two as task-related interference; response three as an external distraction; and response four as a wandering thought. Task-related interference is associated with evaluative thoughts about the task or the completion of the task, including “I’m not very good at this” and “This task is boring” [38]. Accordingly, as attention is not fully focused on the task, these thoughts may also reflect a form of a lapse of attention. Therefore, task-related interference was also examined in the five attention-control tasks.

3.2.4. Five Facets Mindfulness Questionnaire (FFMQ)

The FFMQ, which was adapted for Arabic use in the present study, is a 27-item self-report questionnaire that comprises five subscales assessing different facets of mindfulness as a state: observing (i.e., attending to sensations, perceptions, thoughts, and feelings); describing (i.e., labeling feelings, sensations, and experience with words); acting with awareness; not judging inner experience; and being nonreactive to inner experience. The items are rated on a 5-point Likert-type scale ranging from 1 (never or very rarely true) to 5 (very often or always true). For each scale, higher total scores indicate higher levels of mindfulness. The measure is reported to have good reliability (test-retest and Cronbach’s alpha) and construct validity (confirmatory factor analysis) (Table 1).

3.2.5. Creative Abilities Tests

Five tests from the Arabic version of Guilford and Torrance’s creative thinking batteries, namely, fluency, flexibility, originality, and maintenance of direction were employed to assess the participants’ creative abilities. Verbal fluency and spontaneous flexibility were measured by the utility. Verbal originality was evaluated by employing the remote consequences test. Figural fluency, flexibility, and originality were assessed using the circle test. Adaptive flexibility was measured by sticks and maintenance of direction, determined by the maintenance direction figure. The reliability coefficients of these measures are displayed in Table 2.

Table 1. Reliability and validity of tests (MWQ, MW-D & FFMQ).

Variable	Test-retest reliability (Pearson’s <i>r</i>) N=40	Alpha Cronbach reliability N=40	Confirmatory Factor Analysis N=321		
			GFI	CFI	RMSEA
MWQ	0.74	0.75	0.98	0.97	0.053
MW-D	0.70	0.79	0.99	1.00	0.000
Observing	0.61	0.70			
Describing	0.85	0.78			
Acting with awareness	0.75	0.73			
Not judging inner experience	0.78	0.79			
Nonreactive to inner experience	0.70	0.74			
Total of FFMQ	0.78	0.70	0.84	0.85	0.049

Table 1 indicates that the reliability coefficient and construct validity of all the measures were reasonably high.

Table 2. Reliability of creative abilities tests.

Variable	Test-retest reliability (Pearson's <i>r</i>) N = 30
Verbal Fluency	0.84
Verbal Spontaneous Flexibility	0.70
Verbal Originality	0.58
Figural Fluency	0.72
Figural Flexibility	0.81
Figural Originality	0.40
Adaptive Flexibility	0.67
Maintenance of Direction	0.80

Table 2 indicates that all reliability coefficients were reasonably moderate to high.

3.3. Data Collection

Before completing the measures, the participants reviewed the consent form and were informed that participation was voluntary. Furthermore, they were assured of anonymity and confidentiality with regard to their responses and were not required to write their names on the forms. The tests were completed in group sessions. The data were gathered from March 2021 to July 2021.

4. Results

4.1. Correlations

Pearson's product moment correlations were performed to reveal the relationships between the variables in the current study. The results are displayed in Table 3.

Table 3. Pearson correlation among Mind wandering, mindfulness, and creative abilities.

Independent variable	Dependent variable	R
Spontaneous MW	verbal fluency	0.151–**
	verbal flexibility	0.121–*
	verbal originality	0.027–
	figural fluency	0.146–**
	figural flexibility	0.127–*
	figural originality	0.156–**
	adaptive flexibility	0.092–
	maintenance of direction	0.111–*
Deliberate MW	verbal fluency	0.149–**
	verbal flexibility	0.137–*
	verbal originality	0.052–
	figural fluency	0.127–*
	figural flexibility	0.116–*
	figural originality	0.160–**
	adaptive flexibility	0.084–
	maintenance of direction	0.158–**
Mindfulness	verbal fluency	0.169**
	verbal flexibility	0.187**
	verbal originality	0.098
	figural fluency	0.114*
	figural flexibility	0.137*
	figural originality	0.061
	adaptive flexibility	0.040
	maintenance of direction	0.141*
Spontaneous MW	Mindfulness	0.086–
Deliberate MW		0.139–*

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

An examination of Table 3 reveals a weak negative and significant relationship between spontaneous MW and creative abilities, namely, verbal fluency, verbal flexibility, figural fluency, figural flexibility, figural originality, and maintenance of direction. However, there was no relationship between spontaneous MW and creative thinking abilities, namely, verbal originality and adaptive flexibility.

In addition, there was a weak but positive and significant relationship between mindfulness and creative abilities, namely, verbal flexibility, figural fluency, figural flexibility, and maintenance of direction. On the contrary, the results revealed no relationship between mindfulness and creative thinking abilities, namely, verbal originality, figural originality, and adaptive flexibility. Moreover, although a weak negative relationship was found between deliberate MW and mindfulness. There was no relationship between spontaneous MW and mindfulness.

4.2. Regression Analyses

Creative abilities as dependent variable. First, simple regression analysis was performed with creative abilities as the dependent variable and spontaneous MW and deliberate MW as the independent variables (Table 4).

Table 4. Simple Linear Regression of MW (spontaneous / Deliberate; independent variables) and creative abilities (dependent variables).

Predictor	dependent	R ²	B	f	sig
Spontaneous MW	verbal fluency	0.023	–1.821	7.413	0.007
	verbal flexibility	0.015	–1.080	4.732	0.030
	verbal originality	0.001	–0.123	0.240	0.625
	figural fluency	0.021	–1.961	6.900	0.004
	figural flexibility	0.016	–1.462	5.195	0.023
	figural originality	0.024	–4.459	8.004	0.005
	adaptive flexibility	0.008	–0.996	2.697	0.102
	maintenance of direction	0.012	–1.944	3.978	0.047
Deliberate MW	verbal fluency	0.022	–2.588	7.219	0.008
	verbal flexibility	0.019	–1.758	6.069	0.014
	verbal originality	0.003	–0.334	0.856	0.356
	figural fluency	0.016	–2.467	5.233	0.023
	figural flexibility	0.014	–1.934	4.372	0.037
	figural originality	0.026	–6.567	8.376	0.004
	adaptive flexibility	0.007	–1.317	2.268	0.133
	maintenance of direction	0.025	–3.980	8.144	0.005

* p < .05

A study of Table 4 shows that both spontaneous and deliberate MW predicted low levels of the following

creative abilities: verbal fluency, verbal flexibility, figural fluency, figural flexibility, figural originality, and maintenance of direction. However, both deliberate and spontaneous MW failed to predict verbal originality and adaptive flexibility.

Creative abilities as dependent variable. Simple regression analysis was performed with creative abilities as the dependent variable and mindfulness as independent variable (Table 5).

Table 5. Simple Linear Regression of Mindfulness (independent variable) and creative abilities (dependent variables).

Predictor	dependent	R ²	B	f	sig
Mindfulness	verbal fluency	0.028	0.035	9.331	0.002
	verbal flexibility	0.035	0.044	11.615	0.001
	verbal originality	0.010	0.011	3.062	0.081
	figural fluency	0.013	0.040	4.231	0.041
	figural flexibility	0.019	0.042	6.140	0.014
	adaptive flexibility	0.002	0.011	0.503	0.479
	maintenance of direction	0.020	0.065	6.517	0.011

* p < .05

The results revealed that mindfulness positively predicted creative abilities, specifically verbal fluency, verbal flexibility, figural fluency, figural flexibility, and maintenance of direction. However, it failed to predict verbal originality and adaptive flexibility.

Mindfulness as dependent variable. Simple regression analysis was performed with mindfulness as the dependent variable and spontaneous MW and deliberate MW as the independent variables (Table 6).

Table 6. Simple Linear Regression of spontaneous and Deliberate MW (independent variables) and Mindfulness (dependent variables).

Predictor	dependent	R ²	B	f	sig
Spontaneous MW	Mindfulness	0.007	-3.283	2.385	0.124
Deliberate MW		0.019	-7.624	6.274	0.013

* p < .05

The results revealed that while deliberate MW predicted mindfulness negatively, spontaneous MW failed to predict mindfulness.

4.3. Mediation Analyses

Based on the linear regression results, AMOS SPSS was employed to perform a bootstrap test to calculate the unique direct and indirect associations posited in the hypothesized mediation pattern linking MW and creative abilities through the mediation of role mindfulness. The 200-sample bootstrap procedure was used to estimate bias-corrected 90% confidence intervals (CIs) to test the significance of indirect links. If CIs do not contain 0, the indirect links are significant, thus indicating significant mediation.

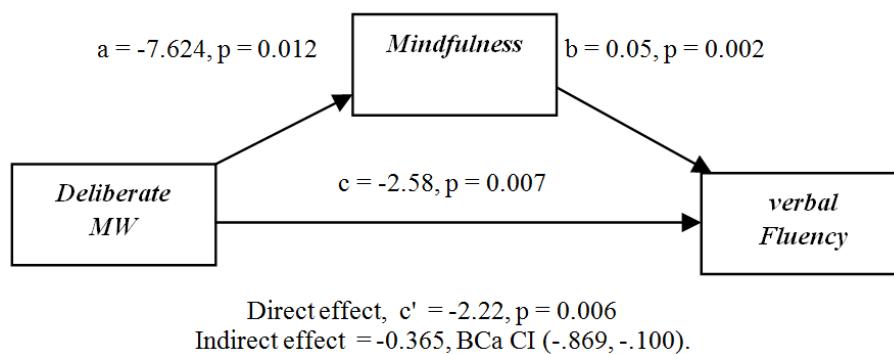


Figure 1. Mediation analysis with verbal fluency as outcome.

The results revealed a significant indirect effect of Deliberate MW on verbal fluency through mindfulness, with partial mediation.

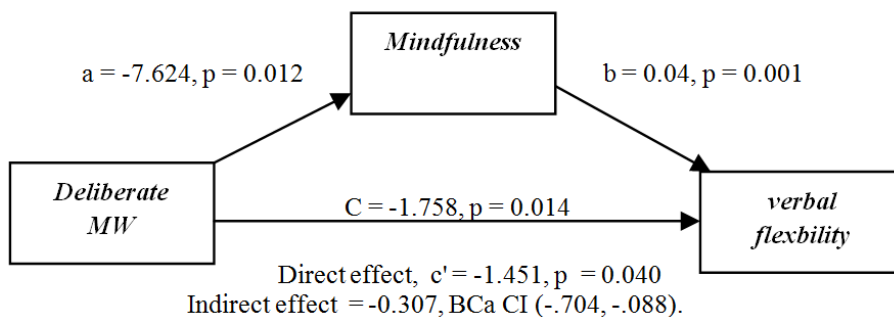


Figure 2. Mediation analysis with verbal Flexibility as outcome.

There was a significant indirect effect of deliberate MW on verbal flexibility through mindfulness, with partial mediation.

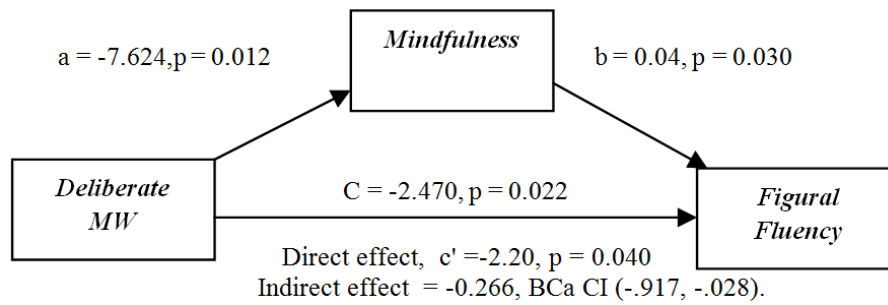


Figure 3. Mediation analysis with figural fluency as outcome.

There was a significant indirect effect of deliberate MW on figural fluency through mindfulness, with partial mediation.

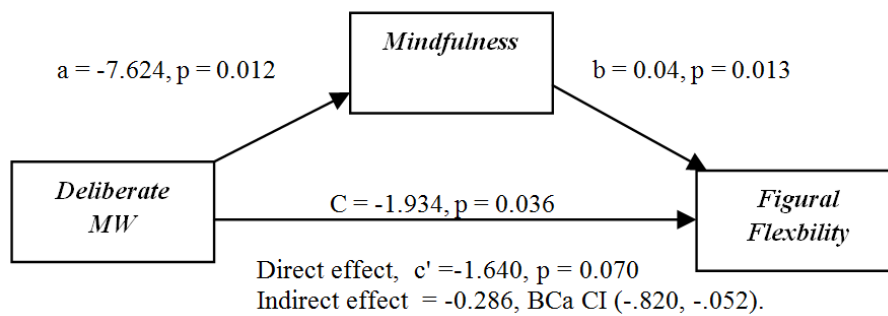


Figure 4. Mediation analysis with figural flexibility as outcome.

There was a significant indirect effect of deliberate MW on figural flexibility through mindfulness, with total mediation.

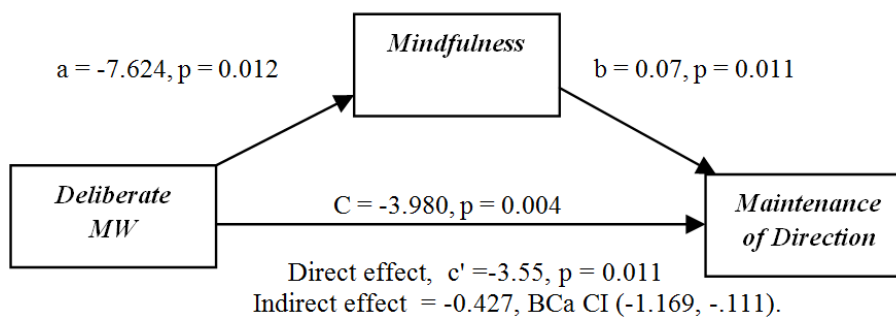


Figure 5. Mediation analysis with maintenance of direction as outcome.

There was a significant indirect effect of deliberate MW on maintenance of direction through mindfulness, with partial mediation.

5. Discussion

In this study, a negative relationship between spontaneous and deliberate MW and creative thinking abilities—namely, fluency, flexibility, originality, and maintenance of direction—was revealed. The results concur with a few related studies [13, 10], which found that participants with high levels of creative abilities had low levels of MW. This may be due to many executive control processes being involved in generating creative ideas. The latter originates with the retrieval of common and old ideas and is subsequently followed by the actual generation of novel and more creative ideas by overcoming of typical or old responses. Conceivably, participants require a considerable

number of control resources to thwart the interference of old ideas or external stimuli as well as maintain attention on idea generation which is achieved by mindfulness as a mental state that forces individuals to focus their attention on the present moment and away from the distractions of the internal and external environments [13].

Accordingly, some researchers examined MW and mindfulness as opposing mental states. In other words, the existence of one excluded that of the other. They conducted studies to test this hypothesis and found a negative correlation between these two mental states. Therefore, MW was responsible for reducing the level of mindfulness, which resulted in inferior task performance. On the contrary, some researchers examined the interaction between MW and mindfulness and found that these mental states occur simultaneously when individuals perform their daily activities instead of focusing on their conflicts [30, 34]. Some studies have indicated that the study of MW is limited when

studied in isolation, that is, without a consideration of its relationship with mindfulness. It may hinder the study of the human mind as an integrated system in general and the inability to determine the most important factors that contribute to determining creative abilities [6, 2, 14].

Vago and Zeidan [41] posited that a more nuanced characterization of mindfulness may involve skillfully moving back and forth between conceptual and nonconceptual processes that support each state in an attempt to realize context-specific demands. During individuals' MW, mindfulness helps them become aware of the theme characterizing their MW. Such awareness occurs the individual becomes aware of the present moment while performing creative tasks. Subsequently, mindfulness allows for the flow of ideas resulting from MW and may lead individuals to focus excessively on these ideas so as to increase the duration of mental wandering, which may result in their failure to complete creative tasks efficiently [41, 1, 4 2].

The results also revealed that while mindfulness mediates the relationship between deliberate mind wandering and creative thinking abilities, it does not determine the relationship between spontaneous mind wandering and creative abilities. This may be due to the combined role of mindfulness and with deliberate mind wandering in executive control processes, wherein deliberate MW attention is consciously shifted from the focal task toward internal thoughts as the individual begins to experience boredom with the tasks. Such a shift increases the level of mindfulness as a result of increased focus. Individuals pay attention to their inner thoughts and feelings, analyze them, and attempt not to judge them so as to make appropriate decisions about them. This phenomenon contrasts with that resulting from spontaneous mind wandering, which occurs beyond the individuals' control [41].

6. Conclusion

The researchers propose that understanding creativity cannot be undertaken by only examining cognitive aspects, including cognitive abilities and cognitive processes, but rather, these abilities must be combined with other psychological variables, which may enhance their activity in individuals. Accordingly, the purpose of this study was to shed light on the nature of the relationship between some mental states represented in MW and mindfulness with creative abilities. Consequently, the current study assumed that mindfulness mediates the relationship between mental wandering and creative abilities. The results revealed that mindfulness mediated the relationship between deliberate mind wandering and some creative abilities (namely, verbal and figural Fluency, verbal flexibility, figural flexibility, and Maintenance of Direction). In addition, the results did not reveal a mediating role of mindfulness in the relationship between spontaneous mind wandering and creative abilities. The current findings warrant further investigation and cross validation in other samples, including those on authors and musicians. The results further suggested that there may be an

incubation period in MW, which increases creativity because MW enhances imagination and liberates individuals' minds from restrictions. It is recommended that this phenomenon be explored in future studies.

7. Limitations and Future Research

Although the study contributes to extant literature, it has two limitations. First, the findings may not apply to other Egyptian undergraduate students because a non-random sample was employed. Second, various factors such as gender, level of task, content of MW, and time spent MW were not considered in this study. This factor may have influenced the results.

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