Exploring the Link Between Mind Wandering, Mindfulness, and Creativity: A Multidimensional Approach

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Abstract

Even if mind wandering (MW) and mindfulness have traditionally been intended as separate and antithetical constructs, the roles of these two mental states on creative behavior were jointly explored in the present paper. In particular, MW was analyzed in light of a recent approach suggesting a differentiation between deliberate and spontaneous MW, whereas mindfulness was analyzed by distinguishing its five different constitutional dimensions: observing, acting with awareness, describing, nonreactivity, and nonjudging. The influence on creativity of these two mental states was analyzed using a sample of 77 undergraduate students both on a performance index (i.e., originality) and on a self-report index (i.e., creative achievement). Results showed that MW and mindfulness dimensions predicted creative behavior both alone and in combination, suggesting a complex interdependence between these two mental states within the creative thinking process. In particular, the critical importance of distinguishing between deliberate and spontaneous MW was revealed by a final path analysis, which revealed the opposite effects of these two dimensions on originality and creative achievement. That is, deliberate MW positively predicted creative performance, whereas spontaneous MW was negatively associated with such performance. Moreover, the nonreactivity and awareness dimensions of mindfulness, the latter in interaction with deliberate MW, emerged as main predictors of response originality. Finally, the describing facet of mindfulness predicted creative achievement both directly and indirectly through an interaction with deliberate MW. The implications emerging from the adoption of a multi-dimensional approach to the analysis of MW and mindfulness in the study of creativity are discussed herein.

Keywords: creativity; deliberate mind wandering; spontaneous mind wandering; mindfulness

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> My summer's wanderings with the pen have . . . shown me one or two new dodges for catching my flies. I have sat here like an improviser with his hands rambling over the piano.
>
> —Virginia Wolf (1930, v. 3, p. 37)

> I find it is very important to work intensively for long hours when I am beginning to see solutions to a problem . . . . You are handling so many variables at a barely conscious level that you can't afford to be interrupted.
>
> —Erwin Land (Taylor, Smith, & Ghiselin, 1963, p. 69)

Creativity has been associated with different mental states, including the motivational status driving the creative process, the aware recruitment of information, and the judging of one's own or others' ideas (Corazza & Agnoli, 2015; Sternberg & Lubart, 1996). Interestingly, the mental dispositions subsuming the generation of original and valuable ideas may appear to be in antithesis. As well described by Virginia Wolf just before the writing of *To the Lighthouse*, creativity might stem from a process characterized by the lack of executive control over our mental activity, a process that can be described as getting lost in our own thoughts. At other times, as captured by Erwin Land, the inventor of the Polaroid camera, it is rather the awareness of our own thoughts, affective states, or physical sensations and the exclusion of distractions from our thinking process that is associated with the potential to see creative solutions. These two apparently contrasting phenomena have been conceptualized by the psychological science into the constructs of mind wandering (MW) and mindfulness. It would be of value to investigate if and to what extent these two constructs are indeed incompatible in the pursuit of creativity or whether and how they can cooperate. The present

study was planned to shed light on the relationships between these two constructs and creativity, using an individual differences approach.

Mind Wandering and Creativity

MW occurs when attention drifts away from an ongoing task or external environment toward internal thoughts unrelated to the task, such as memories or prospective thoughts (Smallwood & Schooler, 2006). Several studies have suggested that MW is associated with negative/maladaptive outcomes: MW often interferes with external task performance and is especially costly in educational/learning and professional contexts (e.g., MW during university lectures; see Risko, Anderson, Sarwal, Engelhardt, & Kingstone, 2012). Research has shown that the experience of MW is associated with reduction in both executive control (as in working-memory capacity, see Conway et al., 2005; Redick et al., 2012; Schooler et al., 2011) and attentional control abilities (as in increased MW under the influence of alcohol; see Finnigan, Schulze, & Smallwood, 2007; Sayette, Reichle, & Schooler, 2009; as in higher frequency of MW in students with attention-deficit hyperactivity disorder; see Hines & Shaw, 1993; Shaw & Giambra, 1993). However, over the last decade, a growing body of research has demonstrated that MW might also be a valuable cognitive capacity, and several adaptive properties have been reported. For example, the experience of MW might help to keep individuals on track to achieve their self-relevant goals and contribute to solving people's current life concerns (Baird, Smallwood, & Schooler, 2011). It might also contribute to maintaining a sense of self-identity and continuity across time (Tulving, 1987; Suddendorf & Corballis, 2007) and facilitating autobiographical planning (Baird et al., 2011). According to recent evidence, MW might also be important for many other mental functions, such as problem-solving abilities (Ruby, Smallwood, Sackur, & Singer, 2013) and delay of gratification (Smallwood et al., 2013).

Inconsistent results have emerged regarding the relationship between MW and creative cognition (Baird et al., 2012; Hao, Wu, Runco, & Pina, 2015). On the one hand, research has demonstrated that taking a break involving an undemanding task characterized by a high level of unrelated thoughts improves creative performance as measured by classic divergent thinking tasks (Baird et al., 2012; Gilhooly, Georgiou, Garrison, Reston, & Sirota, 2012). These results have been explained by means of MW's increase in unconscious associative processing, which produces a spreading activation conducive to higher creative performance (Baird et al., 2012). On the other hand, MW during creative idea generation has been found to be detrimental to creative thinking, in this case also measured by a classic divergent thinking task (Hao et al., 2015). Given that creative idea generation has been shown to involve a top-down executive process characterized by many control processes (inhibition of interfering stimuli, inhibition of dominant but not novel responses, judging and refining of initial ideas, etc.), these results seem to confirm that MW can be considered a control-resource consuming process. Even if apparently contrasting, these results might not be incompatible. Creative thinking is indeed characterized by a complex process involving both implicit associative processes and explicit control processes (Beaty, Benedek, Silvia, & Schachter, 2016), and MW might inversely influence these different processes.

Moreover, these contrasting results should be revised in light of recent data demonstrating a dissociation between different forms of MW, namely between deliberate and spontaneous MW (Seli, Carriere, & Smilek, 2014; Seli, Risko, Smilek, & Schacter, 2016). The difference between these two kinds of MW stem from the process underlying the experience of MW: whether it emerges spontaneously or, somehow, under the individual's mental control. Specifically, in cases of deliberate MW, attention is intentionally shifted from the focal task to internal thoughts, whereas in cases of spontaneous MW, task-unrelated

thoughts capture one's attention, triggering an uncontrolled shift from the task at hand to other trains of thought.

An increasing number of trait-level studies on individual differences in everyday experiences of deliberate and spontaneous MW (as measured, respectively, by the Mind Wandering: Spontaneous Scale and Mind Wandering: Deliberate Scale; Carriere, Seli, & Smilek, 2013) have shown that the two kinds of MW, although positively correlated, are differentially associated with several psychological traits. For example, spontaneous but not deliberate MW has been found to be associated with attention-deficit hyperactivity disorder symptomatology (Seli, Smallwood, Cheyne, Smilek, 2015c), with frequent reports of obsessive–compulsive disorder symptoms (Seli, Risko, Purdon, & Smilek, 2017) and with self-reported fidgeting and self-reported propensity to act mindlessly (without awareness; Carriere et al., 2013). Moreover, scores on the Mind Wandering: Spontaneous (MW–S) Scale were (moderately) associated with attentional distraction and difficulties with attentional shifting, whereas only small correlations with the same measures were found for the Mind Wandering: Deliberate Scale (MW–D; see also Chiorri & Vannucci, in press). To the best of our knowledge, no research has yet investigated the distinct contributions of spontaneous and deliberate MW to creative achievement and creative ideation.

Mindfulness and Creativity

Mindfulness refers to a state of conscious, sustained, and focused awareness resulting from a nonjudgmental attention to the present moment (for a review, see Tang, Hölzel, & Posner, 2015 or Langer & Moldoveanu, 2000). Mindfulness originally stems from Buddhist meditation traditions, which suggest that this state can be enhanced through an intentional regular practice of meditation. Mindfulness has been associated with beneficial effects for cognitive and emotional functioning, including improved working-memory capacity (Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010), improved stress regulation (Shapiro, Carlson,

Astin, & Feedman, 2006), and reduced fear of being judged by others (Carson & Langer, 2006; Tang et al., 2015).

Studies linking mindfulness to creativity have produced mixed results. For example, the results of the studies by Ostafin and Kassman (2012) indicate that mindfulness benefits the ability to solve insight problems. According to the authors, mindfulness might increase creativity by reducing the tendency to rely on habitual responses when searching for a solution. In a related vein, evidence has been reported that some meditation and mindfulness training improve creativity performance (e.g., short-term integrative body–mind training in Ding, Tang, Tang, & Posner, 2014; Ding, Tang, Deng, Tang, & Posner, 2015; meditation based on open monitoring in Colzato, Ozturk, & Hommel 2012; mindful drawing and learning in Grant, Langer, Falk, & Capodilupo, 2004 and Langer, Hatem, Joss, & Howell, 1989). In contrast, Zedelius and Schooler (2015) recently found that a greater tendency toward mindfulness is associated with decreased insight ability, suggesting that mindfulness might impair performance on tasks that rely on spontaneous insights, whereas Remmers et al. (2014) found a negative association between mindfulness and intuitive thinking.

As recently suggested, these discrepancies in the results may be related to the multidimensional nature of the mindfulness experience, and different aspects of mindfulness may differentially predict creativity. Mindfulness is indeed a multifaceted construct; it is composed of different components and skills, including the ability to observe and attend to different stimuli (observing), the ability to focus attention with full awareness (acting with awareness), the ability to describe feelings and beliefs with words (describing), the ability to not react to inner experience (being nonreactive), and the ability to not judge the experience (not judging). According to this multidimensional approach to mindfulness, in four studies, Baas, Nevicka, and Ten Velden (2014) recently showed that only the ability to observe and attend to a variety of different stimuli predicted creativity (which was assessed through both

divergent tasks and a creative achievement measure) positively and consistently. Per the authors, the patterns obtained with the other mindfulness skills were less consistent. Similarly, a recent multilevel meta-analysis carried out by Lebuda, Zabelina, and Karwowski (2015) showed that mindfulness and creativity were significantly related, with a small-to-medium effect size. This effect is stable irrespective of the measure used to define creativity (i.e., performance/potential measures or achievement/self-report measures). However, this association was moderated by the type of mindfulness, for it was significantly lower in the case of the awareness dimension of mindfulness than in the open-monitoring aspect. Even if this meta-analysis did not definitively explain the complex relationship between mindfulness and creativity, it highlighted the importance of regarding mindfulness as a multidimensional construct when explored in relation to creativity.

The importance of distinguishing between the different dimensions of mindfulness has also been highlighted in a recent study by Seli et al. (2014) on the association between mindfulness and spontaneous and deliberate MW. In the study, both spontaneous and deliberate MW were positively associated, although to a small extent, with the tendency to observe and pay attention to a variety of external and internal phenomena. However, only spontaneous MW was strongly associated with difficulty focusing with awareness on one thing at a time as well as difficulty putting thoughts and feelings into words and a decreased ability to accept and be nonjudgmental of one's experiences. Most importantly, spontaneous and deliberate MW showed significant yet opposite relations with the tendency not to react to inner experiences: Spontaneous MW was associated with difficulty taking a nonreactive approach to inner experiences, whereas deliberate MW was associated, albeit to a small extent, with an increased level of nonreactivity.

The Present Study

The literature review revealed that for a long time, MW and mindfulness have been

considered opposite phenomena (e.g., Mrazek et al., 2012). This assumption has also been adopted in the study on creative thinking (e.g., Zedelius & Schooler, 2015), even if, as previously mentioned, eminent creators have exhibited both MW and mindfulness attitudes in the creative process. However, recent evidence has indicated that different kinds of MW, namely spontaneous and deliberate MW, are uniquely associated with some dimensions of mindfulness (Seli et al., 2014). Conflating the two kinds of MW as well as the different dimensions of mindfulness would likely produce underspecified, confounded, or even misleading conclusions.

To the best of our knowledge, no study has explored the contrasting or synergic role of MW and mindfulness dimensions on creative thinking. This gap in the literature is particularly evident in the light of recent research regarding the need to distinguish between spontaneous and deliberate MW and the importance of separately assessing the different dimensions of mindfulness. Could spontaneous and deliberate MW contribute differently to creative thinking? Moreover, could the two kinds of MW interact differently with the various mindfulness dimensions in terms of predicting creativity?

These questions were addressed in the present research by exploring the role of MW and mindfulness dimensions on creativity. As revealed by the literature review, creativity has been measured using different methods aimed at assessing either creative performance or creative achievement. Although MW has only been explored in relation to creative performance (as measured by divergent thinking tasks), mindfulness dimensions have been shown to be related to both creative indexes, even if to different extents. To take into account the complexity of this construct, creativity was here measured both using a creative-thinking performance index (i.e., response originality on a divergent thinking task) and a general index of creative success (i.e., creative achievement as measured by the Creative Achievement Questionnaire; Carson, Peterson, & Higgins, 2005). The initial aim was to understand the

singular and interactive predictive roles of MW and mindfulness dimensions on both creativity indexes. Then, through a path analysis, the hierarchical organization of the various predictors were considered in a single model for the prediction of participants' ideas originality and creative achievement.

Method

Participants

A total of 77 undergraduate students (28.6% female; mean age = 20.42 years, *SD* = 1.69, ranging between 18 and 27 years of age) enrolled at the University of Firenze (Italy) took part in the study. Each participant completed a series of questionnaires and a creative divergent task.

Instruments

Mind Wandering: Deliberate and Mind Wandering: Spontaneous. The MW–D and MW–S are four-item self-report scales to index everyday deliberate and spontaneous MW, respectively (Carriere et al., 2013; Italian validation in Chiorri & Vannucci, in press). The MW–D is scored using a 7-point Likert-type scale, ranging from 1 (*rarely*) to 7 (*a lot*) for Items 1, 2, and 4, and ranging from 1 (*not at all true*) to 7 (*very true*) for Item 3. The MW–S is scored using a 7-point Likert-type scale, ranging from 1 (*rarely*) to 7 (*a lot*) for Items 1, 2, and 4, and ranging from 1 (*almost never*) to 7 (*almost always*) for Item 3. For all cases, participants were asked to select the answer that most accurately reflects their everyday MW, and higher scores reflected a greater tendency to engage in MW spontaneously or deliberately. Previous studies have reported good reliability and discriminant validity of the two scales (Carriere et al., 2013; Chiorri & Vannucci, in press).

Five Facets Mindfulness Questionnaire. The Five Facets Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Italian adaptation by Fossati, Somma, Maffei, & Borroni, 2013) is a 39-item self-report questionnaire composed of five

subscales assessing different facets of a general tendency to be mindful in daily life: 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. 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 indicated a higher level of mindfulness. In the Italian validation study for a nonclinical sample (Fossati et al., 2013), the FFMQ showed acceptable internal consistency for all subscales (Cronbach's αs ranging from .76 to .89).

Creative Achievement Questionnaire. The Creative Achievement Questionnaire (CAQ; Carson et al., 2005) is a widely used measure of creative accomplishments characterized by strong psychometric properties and predictive power for many other questionnaire measures of creativity (for a review, see Silvia, Wigert, Reiter-Palmon, & Kaufman, 2012). The CAQ was designed to capture eminent-level creativity (Silvia et al., 2012), and it focuses on significant, observable accomplishments. Specifically, the CAQ measures creative accomplishments in 10 different domains: visual arts, music, dance, architectural design, creative writing, humor, inventions, scientific discovery, theater and film, and culinary arts. Points are assigned to each domain on seven levels of achievement, with higher points assigned to higher levels, producing skewed scores testifying that only few people can reach the highest levels of creative achievement. Therefore, only people with significant achievements in at least one domain receive high CAQ scores. Scores across domains were summed to obtain a total score of creative achievement for each participant.

Titles Task. The Titles Task **(**Guilford, 1968) is a measure of participants' divergent thinking ability. As is the case for any divergent test, this task is not used to identify a unique correct response; rather, it aims to stimulate the production of multiple alternatives for wide and ill-defined problems. In particular, this task requires the production of alternative titles for

widely known books or movies. To adapt the use of this task to Italian culture, two books and one movie that are very well known to Italian people have been chosen (Agnoli, Corazza, & Runco, 2016). To stimulate the production of alternative titles, participants were reassured that the task did not contemplate any grading and that their ideas were confidential. Specifically, participants were asked to produce as many alternative titles as they could in three minutes per round (for a total of 9 minutes).

The participants generated 1,246 responses. Two independent raters evaluated the originality of each response. Each recorded response was previously transcribed on a spreadsheet and then sorted alphabetically for each target title. This method ensured that the raters were blind to several factors that could have biased their ratings: the response serial position in the set, the total number of responses in the set, and the preceding and following responses. The raters read all responses prior to scoring them, and they scored the responses separately. Each response received a rating on a 1 (*not at all original*) to 5 (*highly original*) scale using the procedure proposed by Silvia et al. (2008). The raters used the scoring criteria proposed by Wilson, Guilford, and Christensen (1953) for individual differences in originality. In their model, creative responses were uncommon, remote, and clever. The raters were told to consider all three dimensions when making their ratings, and they were told that strength in one facet could balance weakness in another (Silvia et al., 2008). Interrater reliability calculated for all alternative titles produced by participants was good (Cohen's $\kappa = .83$). In case of important discrepancies in ratings, raters reviewed and assigned scores by consensus. Moreover, the fluency in the production of titles (i.e., the total number of responses) for each participant was calculated.

Procedure

The self-report measures of MW and mindfulness were administered together with other questionnaires in random order in small-group testing sessions. The Titles Task was

administered in a separate small-group testing session. All participants volunteered to take part in the study after a detailed description of the procedure, and all were treated in accordance with the *Ethical Principles of Psychologists and Code of Conduct* (American Psychological Association, 2010). To be included in the study, participants had to report being at least 18 years of age. They did not receive any compensation for participating.

Results

Descriptive Analyses and Correlations

Descriptive statistics (mean and standard deviations) and Pearson product-moment correlations coefficients for all measures are presented in Table 1. The correlation analysis showed significant positive associations between the CAQ score and the two facets of mindfulness assessed using the FFMQ, observing and attending to sensations, perceptions, thoughts, and feelings (FFMQ–O) and describing one's feelings, sensations, and experience (FFMQ–D). Moreover, both spontaneous and deliberate MW (MW–S and MW–D) showed a significant positive correlation with the observing facet of FFMQ and a negative correlation with the acting with awareness facet of FFMQ (FFMQ–A).

- INSERT TABLE 1 HERE -

Creative Achievement

A series of analyses were performed to identify whether mindfulness and MW dimensions can predict creative achievement scores. Given that CAQ scores are highly skewed, such distribution violates the conventional assumptions at the basis of regression models. For this reason, and in agreement with Silvia and Kimbrel (2010) and Silvia et al. (2012), the main predictors of creative achievement were examined using negative binomial models, which can account for overdispersed outcomes (Hilbe, 2007; Long, 1997).

The five facets of the FFMQ and the MW–S and MW–D scales were included in the model as main predictors of CAQ score. In light of the high correlation between MW-S and

MW-D, interactions between the five facets of FFMQ and the two MW scales were examined in two separate models, the first of which explored the interactions with MW–D and the second of which explored the interactions with MW–S. Given that the first model showed better goodness-of-fit indexes than the second model (Pearson's $X^2/df = .563$, $LR\ X^2_{14} = 27.134$, $p = .018$), the following only reports results related to the model exploring the interactions between the five facets of the FFMQ and the MW-D, therefore providing a better explanation of the variability in the present data. As shown in Table 2, the describing facet of FFMQ emerged as a significant predictor of CAQ. Moreover, the interaction between the describing facet of FFMQ and MW–D significantly predicted CAQ scores.

- INSERT TABLE 2 HERE -

To understand this interaction, a simple slope computation using the logarithmic transformation of the CAQ scores was performed. As shown in Figure 1, this analysis revealed that the describing facet of FFMQ predicted CAQ at low (ß = .04, $SE = .01$, $p < .01$) and medium levels of MW–D (ß = .02, $SE = .01$, $p < .01$), but not at high levels of this variable (ß = .00, $SE = .01$, $p = .98$). Specifically, this result revealed that high degrees of MW–D can reduce the positive effect of the disposition to label and describe experiences on creative achievement, whereas medium and low levels of MW–D can interact with this mindfulness disposition to increase creative achievement.

- INSERT FIGURE 1 HERE -

Originality

A hierarchical multiple regression was used to explore the predictive role of the five facets of FFMQ, MW–D, MW–S, and fluency in predicting originality. Moreover, interactions between FFMQ facets and MW scales were entered in the model by introducing interactions terms created by mean centering variables. Variance inflation factors showed that the model was exempt from multicollinearity (variance inflation factors < 10). Even if the

introduction of the block containing the five facets of FFMQ did not produce a significant change in the regression model, a first evident significant result was a negative association between the nonreactivity to inner experience facet of the FFMQ (FFMQ–NR) and originality (Table 3). This result showed that refraining from evaluation of thoughts and feelings is associated with decreased response originality. A second result emerging from this analysis was the positive prediction of fluency with respect to originality. A third result was the significant interactive effect of the acting with awareness facet of the FFMQ and MW–D on predicting originality. Finally, interaction between the describing facet of the FFMQ and MW–S was significant in terms of predicting originality.

- INSERT TABLE 3 HERE -

To explain the interactions observed in the previous analysis, two simple slope computations were performed. In particular, as shown in Figure 2, the first analysis revealed that the acting with awareness facet of the FFMQ did not predict originality at low (ß = -.01, *SE* = .01, *p* = .17) or medium levels of MW–D (ß = .01, *SE* = .01, *p* = .54), though it did at high levels of MW–D (ß = .02, *SE* = .11, *p* = .03). Specifically, as depicted in Figure 2, this result revealed that only at high levels of MW–D was the mindfulness ability of focusing attention on one's current activity associated with increased originality in the produced responses.

- INSERT FIGURE 2 HERE -

The second analysis revealed, as shown in Figure 3, that at a low level of MW–S, an increase in the describing facet of the FFMQ produced a significant decrease of response originality (ß = -.02, *SE* = .01, *p* = .04). Yet, this effect was not significant either at medium (ß = -.01, *SE* = .01, *p* = .70) or high levels of MW–S (ß = .02, *SE* = .01, *p* = .14). This shows that the interaction between the mindfulness tendency to describe experiences and a low use

of spontaneous MW leads to decreased response originality; however, with the increase of the use of spontaneous MW, this relationship totally disappears.

- INSERT FIGURE 3 HERE -

Path Analysis

A final path analysis was performed to model and test the direct and indirect effects of the variables emerged in the previous analyses as significant predictors of response originality and creative achievement. Path analysis, as a generalization of multiple regressions, allows us to estimate the strength and sign of directional relationships for hypothetical schemes with multiple dependent and independent variables. In particular, a hypothetical scheme was modeled starting from the potential effects displayed in the previous analyses, testing both originality and creative achievement in a single model, to calculate the direction and estimates of the strength of the relationships of MW and mindfulness dimensions on both creative variables, while taking into account the within-subject nature of the present data.

In particular, MW–D, MW–S, fluency, the acting with awareness facet of the FFMQ (FFMQ–A), the describing facet of the FFMQ (FFMQ–D), and the nonreactivity facet of the FFMQ (FFMQ–NR) were entered in the model as observed dependent variables, whereas participants' scores for originality and CAQ were entered as observed independent variables. Following results emerged from previous analyses, MW–D, MW-S, fluency, FFMQ–A, and FFMQ–NR was associated with originality, whereas FFMQ–D was directly associated with creative achievement. Furthermore, to test for indirect effects, specifically for moderations revealed in the previous analyses, the procedure proposed by Baron and Kenny (1986; see also Frazier et al., 2004) was followed, so independent variables were centered around their mean to create interaction terms. The interactions resulting from the product of the mean-centered variables were entered in the model. Model estimation was performed with MPLUS 7.4.

The model depicted in Figure 4 fits the data well: $\chi^2(6) = 5.80$, $p = .44$; *CFI* = 1.0, *TLI* = 1.0, *RMSEA* = .00, 90% *CI* [.00, .01], *SRMR* = .03. The R^2 for the endogenous variables indicates that the model accounts for 33% of the variance in originality and 15% of the variance in creative achievement. All estimated coefficients were statistically significant, with a satisfactory effect size, except for the FFMQ–A and fluency, which showed an almost-significant effect on originality. As shown in Figure 4, the main effect of both MW–D and MW–S on originality was significant (in opposite directions) in the model, confirming the trend observed after regression analysis. Whereas MW–D positively predicted originality, MW–S was negatively associated with originality. Moreover, the FFMQ–NR was negatively associated with originality, though the FFMQ–D was positively associated with CAQ. Along with the direct paths shown in Figure 4, all interaction terms were statistically significant, consistent with the interactive effect of MW–S and MW–D with the dimensions of the FFMQ observed in the previous separate analyses.

- INSERT FIGURE 4 HERE -

Discussion

The present paper provides the first exploration of the interactive role of MW and mindfulness dimensions with respect to the prediction of creativity. Notwithstanding the general belief that these two mental dispositions are contrasting phenomena, the present study showed the unique and interactive role of MW and mindfulness dimensions in predicting creative performance and creative achievement. In particular, the results demonstrated that MW and mindfulness are not mutually exclusive phenomena; rather, when considered multidimensional constructs, they interacted to explain creative behavior.

Previous research (Seli et al., 2014) was confirmed by showing that spontaneous and deliberate MW are related to mindfulness dimensions in different ways. However, most importantly for the aim of the present paper, the present results showed that MW and

mindfulness interact in terms of predicting creativity. Specific main and interactive effects were observed for the prediction of the self-report creative index (creative achievement) and the creative performance index (originality) explored in the present study. To wit, when the two indexes were explored separately, the describing facet of the FFMQ was a main predictor of creative achievement. This result highlighted the ability to describe internal experiences with words as an essential element of creative success. The ability to bring original and complex ideas from the internal to the external world indeed seems a fundamental prerequisite for creative success. As discussed in the literature, communicating ideas is important for creative achievement (Binnewies, Ohly, & Sonnentag, 2007). Without the ability to adequately describe thoughts or mental products, even the most original ideas could indeed not achieve success. Moreover, through an interaction effect, to reach the highest creative achievements levels, the ability to describing should be joined with a low or medium level of deliberate MW. High levels of deliberate MW hamper, rather than enhance, the effect of the describing ability. This result seems to reveal that deliberate MW can increase the beneficial effects of the ability to describe internal experiences with words, as if the attitude to deliberately get lost in task-unrelated thoughts could help describe complex and creative ideas to the external world. However, excessive MW, even excessive deliberate MW, seems to undo the benefits of mindfulness. In other words, this finding reveals that the ability to represent internal experiences with words is even more important for predicting creative success if an individual's attention tends to be intentionally shifted from external focal tasks to internal experiences (i.e., if the mindfulness describing dimension is joined with the basic mechanism defining deliberate MW). Moreover, based on this result, it is reasonable to hypothesize that there is an optimal level of deliberate MW to help describe internal creative experiences, which, in turn, may lead to creative success. How this optimal level is defined

and how it changes according to different creative achievements are questions for future research.

A primary finding from the analyses performed on originality showed that the nonreactivity facet of the FFMQ negatively predicted this divergent thinking performance index. The fundamental mindfulness ability to not react to inner experience, therefore, was observed to be detrimental to the production of original ideas. Originality is strictly associated with the ability to feel and recognize intense new internal feelings that must be externalized, especially when associated with the artistic creative production (Silvia, 2005). Creativity researchers have extensively explored the association between emotions, mood, and creativity (e.g., Baas, De Dreu, & Nijstad, 2008; Kaufman, 2003; Vosburg, 1998). In particular, activating mood states (such as anger, fear, or happiness) can affect creative performance: although activating negative emotions enhances originality through enhanced perseverance, activating positive emotions enhances originality through enhanced cognitive flexibility (De Dreu, Baas, & Nijstad, 2008). Nonreactivity to the activation produced by internal feelings may, in fact, block emotions' beneficial effects on the production of original ideas. This finding was reinforced by an interaction effect, namely that deliberate MW and the awareness facet of mindfulness work together to predict originality.. In particular, high levels of originality were associated with high levels of deliberate MW, which interacted with the ability to focalize with full awareness. This result suggests that the ability to generate original ideas is linked with the tendency to deliberately think beyond immediately relevant concepts, but, at the same time, a high ability to reconnect with full awareness to the initial focus is needed to generate original and effective ideas. This interpretation seems consistent with research showing that the most original ideas are associated with the ability to also pay attention to irrelevant information (i.e., information not apparently related to the task focus; Agnoli, Franchin, Rubaltelli, & Corazza, 2015; Dailey, Martindale, & Borleum, 1997).

Similarly, deliberate MW may serve to introduce irrelevant information into the thinking process, whereas the awareness dimension of mindfulness may help connect the concepts activated by MW to the task focus. Moreover, this result sheds new light on the role of the mindfulness awareness facet on creative performance. Although Lebuda et al. (2015) showed the minor role played by the awareness facet in the analysis of the creative behavior, the results of this study suggest that awareness may play a main role in the explanation of the creative performance if explored in interaction with other mental dispositions (in this case, in interaction with deliberate MW).

Finally, a second interaction effect showed that the lowest originality scores occurred when a spontaneous tendency to engage in MW meets the mindfulness ability to describe internal feelings. Despite only being significant at low spontaneous MW levels, this effect could suggest a detrimental effect on originality of the joint action of spontaneous MW and the mindfulness describing facet. As indicated by this result, people can hardly produce original responses if their attention is captured without any conscious control by task-unrelated thoughts and if these uncontrolled thoughts meet an individual disposition to describe the resultant feelings.

The effects observed from the separate analyses performed on creative achievement and originality were mainly confirmed through the path analysis performed jointly on both indexes. In this case, originality and creative achievement were predicted in a single model, that accounted for the within-subject nature of the present data. When originality and creative-achievement variances were predicted in a single model, spontaneous and deliberate MW were significant direct predictors of originality. Specifically, deliberate MW emerged as a main positive predictor, whereas spontaneous MW was negatively associated with originality, confirming the trends observed in the interaction effects revealed by the previous analyses. The control over the MW state can be considered a central element in the creative production

insofar as it may increase response originality by introducing thought not apparently related to the creative focus into the thinking process. Spontaneous MW was, on the contrary, detrimental to originality, suggesting once again that control of the thinking process is a central requirement for creative thinking. The importance of deliberate metacognitive controls over the creative process has been already highlighted by past research. Feldhusen (1995) suggested that metacognition (i.e., control over goal setting, planning, use of cognitive processes, etc.) is one of the main prerequisites for creative thinking. As previously mentioned, the ability to control the switch of attention from the actual focal task could be considered a main mechanism to manage the introduction of irrelevant information into the divergent thinking process (i.e., irrelevant processing; Agnoli et al., 2015), which is a main attentional mechanism yielding higher originality. More generally, the opposite pattern, which was obtained with the two kinds of MW, might, at least in part, contribute to explaining the mixed findings reported in the literature on the association between MW and creativity (Baird et al., 2013; Hao et al., 2015).

The other effects revealed by the separate analyses were also confirmed by the final model. Therefore, including originality and creative achievement in a single model allowed us to understand how MW and mindfulness differently and cumulatively influence creativity at the levels of real-time performance and life-scale achievement. Exploring how these mental dispositions impact actual creative performance within the same individuals as well how these mental dispositions impact a broader index of creative success helped us helped us arrive at a phenomenological understanding of the level at which different MW and mindfulness dimensions affect multifaceted individual creativity.

Limitations and Future Developments

Even if a multidimensional approach offered the unique opportunity to account for the complexity of the two constructs, the correlational nature of the present work imposes some

limits on the generalizability of the results. Moreover, the difference in the scales of the measures used in the current study might have affected the results because of method variance. For these reasons, future studies should also analyze the interaction between MW and mindfulness using an experimental approach. In particular, using the results of the present study as a baseline, future research may facilitate the development of appropriate experimental paradigms to understand the causal role of both constructs with respect to the dynamics of the creative thinking process (Corazza, 2016).

References

Agnoli, S., Corazza, G. E., & Runco, M. A. (2016) Estimating Creativity with a Multiple-Measurement Approach Within Scientific and Artistic Domains. *Creativity Research Journal, 28*, 171-176, doi: 10.1080/10400419.2016.1162475

Agnoli S., Franchin L., Rubaltelli E., & Corazza G.E. (2015). An eye- tracking analysis of irrelevance processing as moderator of openness and creative performance. *Creativity Research Journal, 27*, 125–132. doi: 10.1080/10400419.2015.1030304

Baas, M., de Dreu, C., & Nijstad, B. A. (2012). Emotions that associate with uncertainty lead to structured ideation. *Emotion, 12*, 1004-1014. doi: 10.1037/a0027358

Baas, M., Nevicka, B., & Ten Velden, F. S. (2014). Specific Mindfulness Skills Differentially Predict Creative Performance. *Personality and Social Psychological Bulletin, 40*, 1092-1106. doi: 10.1177/0146167214535813

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using Self-Report Assessment Methods to Explore Facets of Mindfulness. *Assessment, 13*, 27-45. doi: 10.1177/1073191105283504

Baird, B., Smallwood, J., Mrazek, M. D., Kam, J. W., Franklin, M. S., & Schooler, J. W. (2012). Inspired by distraction: Mind wandering facilitates creative incubation. *Psychological Science, 23*, 1117–1122. doi: 10.1177/0956797612446024.

Baird, B., Smallwood, S., & Schooler, J. W. (2011). Back to the future: Autobiographical planning and the functionality of mind-wandering. *Consciousness and Cognition*, *20*, 1604–1611. doi: 10.1177/0956797612446024

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social

psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173–1182.

Beaty, R. E., Benedek, M., Silvia, P. J., Schachter, D. L. (2016). Creative cognition and brain network dynamics. *Trends in Cognitive Sciences, 20*, 87-95. doi: 10.1016/j.tics.2015.10.004

Binnewies, C., Ohly. S., & Sonnentag. S. (2007). Taking personal initiative and communicating about ideas: What is important for the creative process and for idea creativity? *European Journal of Work and Organizational Psychology, 16*, 432-455. doi: 10.1080/13594320701514728

Brown, K.W., & Ryan, R.M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*, 822–848. doi: 10.1037/0022-3514.84.4.822

Carriere, J, S. A., Seli, P., & Smilek, D. (2013). Wandering in both mind and body: Individual differences in mind wandering and inattention predict fidgeting. *Canadian Journal of Experimental Psychology, 67*, 19-31.

Carson, S. H., & Langer, E. J. (2006). Mindfulness and self-acceptance. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, *24*, 29-43. doi:10.1007/s10942-006-0022-5

Carson, S. H., Peterson, J. B., & Higgins, D. M. (2005). Reliability, validity, and factor structure of the Creative Achievement Questionnaire. *Creativity Research Journal, 17,* 37–50. DOI:10.1207/s15326934crj1701_4

Chiorri, C., & Vannucci, M. (in press). Replicability of the psychometric properties of trait levels measures of spontaneous and deliberate mind wandering. *European Journal of Psychological Assessment*

Colzato, L.S., Ozturk, A., & Hommel, B. (2012). Meditate to create: The impact of focused attention and open-monitoring training on convergent and divergent thinking. *Frontiers in Psychology, 3*, 116. doi: 10.3389/fpsyg.2012.00116

Corazza, G. E. (2016). Potential Originality and Effectiveness: The Dynamic Definition of Creativity. *Creativity Research Journal, 28*, 258-267. doi: 10.1080/10400419.2016.1195627

Corazza, G. E., & Agnoli, S. (2015). On the path towards the science of creative thinking. In G. E. Corazza, & S. Agnoli (Eds.), *Multidisciplinary Contributions to the Science of Creative Thinking*. Singapore: Springer.

Conway, A. R. A., Kane, M. J., Bunting, M. F., Hambrick, D. Z., Wilhelm, O., & Engle, R. W. (2005). Working memory span tasks: A method- ological review and user's guide. *Psychonomic Bulletin & Review, 12,* 769 –786. doi: 10.3758/BF03196772

Dailey, A., Martindale, C., & Borleum, J. (1997). Creativity, synesthesia, and physiognomic perception. *Creativity Research Journal, 10*, 1–8. doi: 10.1207/s15326934crj1001_1

De Dreu, C. K. W., Baas, M., & Nijstad, B. A. (2008). Hedonic tone and activation in the mood-creativity link: Towards a dual pathway to creativity model. *Journal of Personality and Social Psychology, 94,* 739–756. doi:10.1037/0022-3514.94.5.739

Ding, X., Tang, Y., Deng, Y., Tang, R., & Posner, M.I. (2015). Mood and personality predict improvement in creativity due to meditation training. *Learning and Individual Differences, 37*, 217–221.

Ding, X., Tang, Y., Tang, R., & Posner, M.I. (2014). Improving creativity performance by short-term meditation. *Behavioral and Brain Functions, 10*. doi: 10.1186/1744.9081.10.9

Feldhusen, J. F. (1995). Creativity: A knowledge base, metacognitive skills, and personality factors. *Journal of Creative Behavior, 29*, 255-268.

Finnigan , F., Schulze , D. & Smallwood , J. (2011). Alcohol and the wandering mind: A new direction in the study of alcohol on attentional lapses. *International Journal on Disability and Human Development*, *6*, 189-200. doi:10.1515/IJDHD.2007.6.2.189

Fossati A., Somma A., Maffei C. e Borroni S. (2013). Il ruolo dei deficit di mindfulness nella disregolazione emotiva e comportamentale: uno studio italiano su soggetti non clinici. [The role of Mindfulness deficiencies in emotional and behavioural dysregulation: an Italian study on non-clinical subjects] *Psicoterapia Cognitiva e Comportamentale, 19*, 43-62.

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology, 51*, 115–134. doi: 10.1037/0022-0167.51.1.115

Gilhooly, K. J., Georgiou, G. J., Garrison, J., Reston, J. D., & Sirota, M. (2012). Don't wait to incubate: Immediate versus delayed incubation in divergent thinking. *Memory & cognition*, *40*, 966-975. doi: 10.3758/s13421-012-0199-z

Grant , A. M., Langer, E. J., Falk, E., & Capodilupo C. (2004). Mindful Creativity: Drawing to Draw Distinctions. *Creativity Research Journal, 16*, 261-265. doi: 10.1080/10400419.2004.9651457

Guilford, J. P. (1968). *Creativity, intelligence and their educational implications*. San Diego, CA: EDITS/Knapp.

Hao N., Wu M., Runco M. A., & Pina J. (2015). More mind wandering, fewer original ideas: Be not distracted during creative idea generation. *Acta Psychologica, 16*, 110-116. doi:

10.1016/j.actpsy.2015.09.001

Hilbe, J. M. (2007). *Negative binomial regression*. New York: Cambridge University Press.

Hines, A.M. & Shaw, G.A (1993). Intrusive thoughts, sensation seeking, and drug use in college students. *Bulletin of the Psychonomic Society, 31*, 541-544. doi: 10.3758/BF03337347

Jha, A. P., Stanley, E. A., Kiyonaga, A., Wong, L., & Gelfand, L. (2010). Examining the protective effects of mindfulness training on working memory capacity and affective experience. *Emotion*, 10, 54-64. doi: 10.1037/a0018438

Kaufmann, G. (2003). Expanding the mood– creativity equation. *Creativity Research Journal, 15*, 131–135. doi: 10.1080/10400419.2003.9651405

Langer, E. , Hatem, M., Joss, J., & Howell, M. (1989). Conditional teaching and mindful learning. *Creativity Research Journal, 2*, 139-150. doi: 10.1080/10400418909534311

Langer, E. J., & Moldoveanu, M. (2000). The construct of mindfulness. *Journal of social issues,* 56, 1-9.

Lebuda, I., Zabelina, D. L., & Karwowski, M. (2015). Mind full of ideas: A meta-analysis of the mindfulness–creativity link. *Personality and Individual Differences, 93*, 22-26. doi: 10.1016/j.paid.2015.09.040

Long, J. S. (1997). *Regression models for categorical and limited dependent variables*. Thousand Oaks, CA: Sage.

McVay, J. C., & Kane, M. J. (2010). Does mind wandering reflect executive function or executive failure? Comment on Small- wood and Schooler (2006) and Watkins (2008).

Psychological Bulletin, 136, 188–197.

Mooneyham, B. W., & Schooler, J. W. (2013). The costs and benefits of mind-wandering: A review. *Canadian Journal of Experimental Psychology, 67*, 11–18. http://dx.doi.org/10.1037/A0031569.

Mrazek, M. D., Smallwood, J., & Schooler, J. W. (2012). Mindfulness and mind-wandering: Finding convergence through opposing constructs. *Emotion*, *12*, 442–448. doi: 10.1037/a0026678

Ostafin, B. D., & Kassman, K. T. (2012). Stepping out of history: Mindfulness improves insight problem solving. *Consciousness and Cognition, 21*, 1031-1036. doi: 10.1016/j.concog.2012.02.014

Redick, T. S., Broadway, J. M., Meier, M. E., Kuriakose, P. S., Unsworth, N., Kane, M. J., et al. (2012). Measuring WM capacity with automated complex span tasks. *European Journal of Psychological Assessment*, *28*, 164–171. doi: 10.1027/1015-5759/a000123

Remmers, C., Topolinski S., & Michalak, J. (2014). Mindful(l) intuition: Does mindfulness influence the access to intuitive processes? *The Journal of Positive Psychology, 10,* 282-292. doi: 10.1080/17439760.2014.950179

Risko, E. F., Anderson, N., Sarwal, A., Engelhardt, M., & Kingstone, A. (2012). Everyday Attention: Variation in Mind Wandering and Memory in a Lecture. *Applied Cognitive Psychology*, *26*, 234-242. doi: 10.1002/acp.1814

Ruby F. J. M., Smallwood J., Sackur J., & Singer T. (2013) Is self-generated thought a means of social problem solving? *Frontiers in Psycholo*gy, *4*. doi: 10.3389/fpsyg.2013.00962

Sayette, M. A., Reichle, E. D., & Schooler, J. W. (2009). Lost in the Sauce: The Effects of Alcohol on Mind Wandering. *Psychological Science*, *20*, 747-752. doi: 10.1111/j.1467-9280.2009.02351.x

Seli, P., Carriere, J. S. A., & Smilek D. (2014). Not all mind wandering is created equal: dissociating deliberate from spontaneous mind wandering. *Psychological Research, 79*, 750-758. doi: 10.1007/s00426-014-0617-x

Seli, P., Risko, E. F., Purdon, C., & Smilek, D. (2016). Intrusive thoughts: linking spontaneous mind wandering and OCD symptomatology. *Psychological Research, 81*, 392-398. doi:10.1007/s00426-016-0756-3

Seli P., Risko E. F., Smilek D., & Schacter, D. L. (2016). Mind-wandering with and without intention. *Trends in Cognitive Science, 20*, 605-617. doi. 10.1016/j.tics.2016.05.010

Seli, P., Smallwood, J., Cheyne, J. A., & Smilek, D. (2015). On the relation of mind wandering and ADHD symptomatology. *Psychonomic Bullettin and Review, 22*, 629-636. doi:10.3758/s13423-014-0793-0

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology*, *62*, 373-386. doi: 10.1002/jclp.20237

Schooler, J. W., Smallwood, J., Christoff, K., Handy, T. C. , Reichle, E. D., & Sayette, M. A. (2011). Meta-awareness, perceptual decoupling and the wandering mind. *Trends in Cognitive Sciences, 15,* 319-326. doi: 10.1016/j.tics.2011.05.006

Shaw, G. A., Giambra, L. (1993). Task‐unrelated thoughts of college students diagnosed as hyperactive in childhood. *Developmental Neuropsychology, 9*, 17-30. doi: 10.1080/87565649309540541

Silvia, P. J. (2005). Emotional responses to art: From collation and arousal to cognition and emotion. *Review of General Psychology, 9*, 342–357. doi: 10.1037/1089-2680.9.4.342

Silvia, P. J., & Kimbrel, N. A. (2010). A dimensional analysis of creativity and mental illness: Do anxiety and depression symptoms predict creative cognition, creative accomplishments, and creative self-concepts? *Psychology of Aesthetics, Creativity, and the Arts, 4*, 2– 10. doi: 10.1037/a0016494

Silvia, P. J., Wigert, B., Reiter-Palmon, R., & Kaufman, J. C. (2012). Assessing Creativity With Self-Report Scales: A Review and Empirical Evaluation. *Psychology of Aesthetics, Creativity, and the Arts, 6*, 19–34. doi: 10.1037/a0024071

Silvia, P. J., Winterstein, B. P., Willse, J. T., Barona, C. M., Cram, J. T., Hess, K. I., et al. (2008). Assessing creativity with divergent thinking tasks: Exploring the reliability and validity of new subjective scoring methods. *Psychology of Aesthetics, Creativity, and the Arts, 2*, 68–85. doi: 10.1037/1931-3896.2.2.68

Smallwood, J. (2013). Distinguishing how from why the mind wanders: A process-occurrence framework for self-generated mental activity. *Psychological Bulletin, 139*, 519–535. http://dx.doi.org/10.1037/a0030010.

Smallwood, J., & Schooler, J. W. (2006). The restless mind. *Psychological Bulletin, 132*, 946–958. http://dx.doi.org/10.1037/0033-2909.132.6.946.

Sternberg, R. J., & Lubart, T. I. (1996). Investing in creativity. *American Psychologist, 51*(7), 677-688. doi:10.1037/0003-066X.51.7.677

Suddendorf, T., & Corballis, M. C. (2007). The evolution of foresight: What is mental time travel and is it unique to humans? *Behavioral and Brain Sciences, 30*, 299–351. doi: 10.1017/S0140525X07001975

Tang, Y., Hölzel, B. K., & Posner, M. I. (2015). The neuroscience of mindfulness meditation. *Nature Reviews Neuroscience, 16*, 213–225. doi:10.1038/nrn3916

Taylor, C. W., Smith, W. R., & Ghiselin, B. (1963). The creative and other ocntributions of one sample of research scientists. In C. W. Taylor and F. Barron (eds.), *Scientific Creativity: Its Recognition and Development (*pp. 53-76). Wiley, New York, 1963.

Tulving, E. (1987). Multiple memory systems and consciousness. *Human Neurobiology, 6*, 67-80.

Vosburg, S. K. (1998). Mood and the quantity and quality of ideas. *Creativity Research Journal, 11*, 315–331. doi: 10.1207/s15326934crj1104_5

Wilson, R. C., Guilford, J. P., & Christensen, P. R. (1953). The measurement of individual differences in originality. *Psychological Bulletin, 50,* 362–370.

Woolf, V. (1975, 1977, 1980). *The diary of Virginia Woolf*. Vols. 1–3. 1915–1930 (A. O. Bell, Ed., Vol. 1; A. O. Bell & A. McNeillie, Eds., Vols. 2–3). New York: Harcourt Brace & Company.

Zedelius, C. M., & Schooler, J. W. (2015). Mind wandering "Ahas" versus mindful reasoning: alternative routes to creative solutions. *Frontiers in Psychology, 6*, 1-16. doi: 10.3389/fpsyg.2015.00834

Table 1. Descriptive statistics and correlations among the study variables.

	1	2	3	4	5	6	7	8	9	10
1. CAQ	-									
2. Originality	.018	-								
3. Fluency	.112	.289*	-							
4. FFMQ_Observing	.251*	.100	.031	-						
5. FFMQ_Describing	.305**	-.016	.094	.268*	-					
6. FFMQ_Act with awareness	.086	-.104	.045	-.256*	.155	-				
7. FFMQ_Nonjudgment	-.140	.034	.003	-.345**	.188	.086	-			
8. FFMQ_Nonreaction	.068	-.213	-.005	-.166	.129	.057	.123	-		
9. MW_Deliberate	.016	.188	.116	.299**	.034	-.354**	.111	.096	-	
10. MW_Spontaneous	-.017	.014	.020	.246*	-.053	-.526**	-.165	-.073	.512**	-
Mean	8.55	1.77	13.53	28.31	29.13	26.29	25.06	19.12	4.87	4.47
SD	11.46	.45	5.32	3.54	5.00	6.73	6.59	3.95	1.21	1.27

Notes: *p<.05; **p<.01. MW = Mind Wandering

Table 2. Negative binomial regressions on creative achievement scores.

	Creative Achievement	
	b	CI
FFMQ_Observing	.010	-.276 to .296
FFMQ_Describing	.345**	.108 to .581
FFMQ_Act with awareness	-.114	-.343 to .115
FFMQ_Nonjudgment	-.095	-.328 to .138
FFMQ_Nonreaction	-.033	-.383 to .317
MW_Deliberate	.146	-2.247 to 2.259
MW_Spontaneous	.063	-.211 to .338
FFMQ_Observing X MW_Deliberate	.008	-.044 to .059
FFMQ_Describing X MW_Deliberate	-.059*	-.105 to -.012
FFMQ_Act with awareness X MW_Deliberate	.025	-.019 to .069
FFMQ_Nonjudgment X MW_Deliberate	.015	-.030 to .060
FFMQ_Nonreaction X MW_Deliberate	.012	-.055 to .078

Notes: *p<.05; **p<.01. n = 77. The confidence intervals display the symmetric 95% limits (i.e., upper and lower 2.5%)

Table 3. Hierarchical multiple regression on originality scores.

	Originality				
	Step 1	Step 2	Step 3	Step 4	Step 5
Age	.14	.21	.21	.20	.19
Gender	-.18	.27*	-.25	-.36**	-.35**
FFMQ_Observing		.06	-.02	-.02	.03
FFMQ_Describing		-.09	-.06	-.11	-.03
FFMQ_Act with awareness		-.01	-.02	-.02	.03
FFMQ_Nonjudgment		-.02	-.10	-.10	-.18
FFMQ_Nonreaction		-.29*	-.31*	-.33**	-.25*
MW_Deliberate			.26	.18	.24
MW_Spontaneous			-.15	-.13	-.21
Fluency				.35**	.23*
FFMQ_Observing X MW_Deliberate					.28
FFMQ_Describing X MW_Deliberate					-.20
FFMQ_Awareness X MW_Deliberate					.36**
FFMQ_Nonjudgment X MW_Deliberate					.02
FFMQ_Nonreaction X MW_Deliberate					.09
FFMQ_Observing X MW_Spontaneous					-.30
FFMQ_Describing X MW_Spontaneous					.47**
FFMQ_Awareness X MW_ Spontaneous					-.12
FFMQ_Nonjudgment X MW_ Spontaneous					.13
FFMQ_Nonreaction X MW_ Spontaneous					.03
R^2	0.02	0.05	0.07	0.18	0.32
ΔR^2	0.02	0.03	0.02	0.11	0.14
F	1.82	1.56	1.61	2.65**	2.79**
ΔF	1.82	1.44	1.68	9.99**	2.38*
df	74	69	67	66	56

*Note*s: Step 1: Age, Gender (1= male; 2=female); Step 2: FFMQ dimensions; Step 3: Mind wandering (MW) dimensions; Step 4: Fluency; Step 5: Interactions between FFMQ dimensions and MW dimensions. Numbers in the predictors rows represent standardized regression coefficients; * $p < .05$, ** $p < .01$

Figure captions

Figure 1. The moderating effect of deliberate mind wandering on the describing facet of mindfulness in the prediction of creative achievement.

Figure 2. The moderating effect of deliberate mind wandering on the acting with awareness facet of mindfulness in the prediction of originality.

Figure 3. The moderating effect of spontaneous mind wandering on the describing facet of mindfulness in the prediction of originality.

Figure 4. Path model with standardized coefficients.

Figure 1

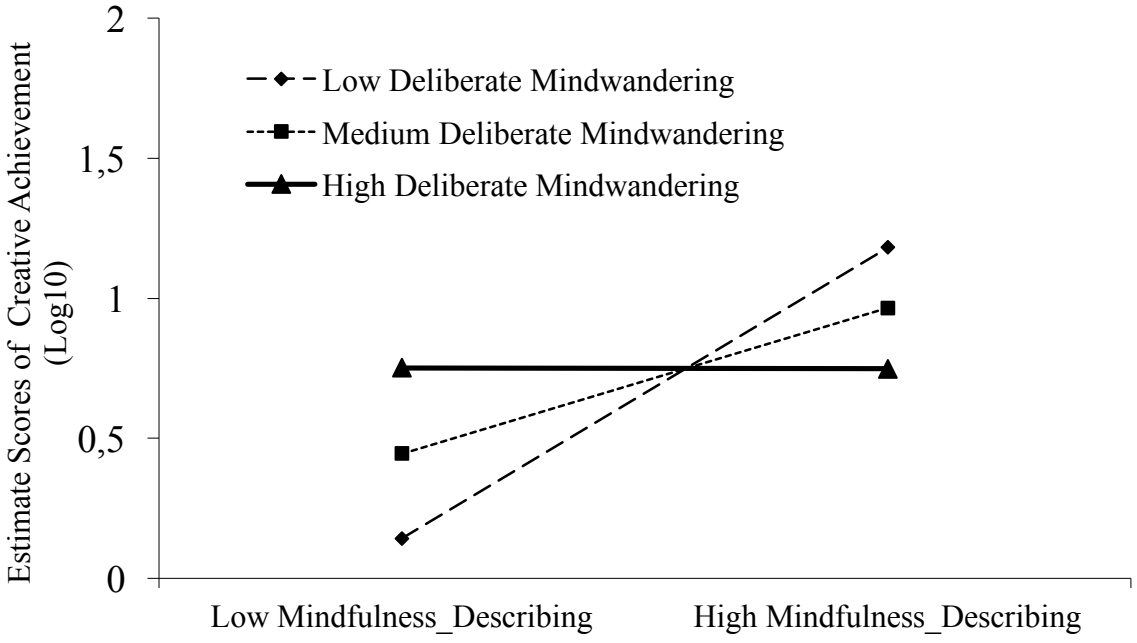

2
1,5
1
0,5
0
Estimate Scores of Creative Achievement (Log10)
Low Deliberate Mindwandering
Medium Deliberate Mindwandering
High Deliberate Mindwandering
Low Mindfulness_Describing
High Mindfulness_Describing

Figure 2

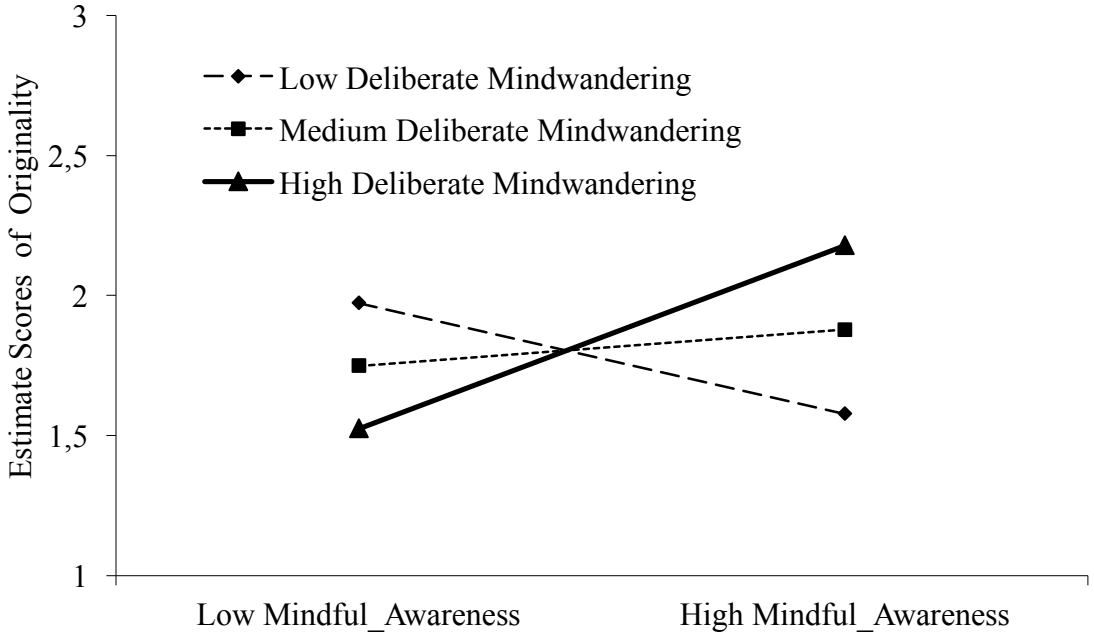

3
2,5
2
1,5
1
Estimate Scores of Originality
Low Deliberate Mindwandering
Medium Deliberate Mindwandering
High Deliberate Mindwandering
Low Mindful_Awareness
High Mindful_Awareness

Figure 3

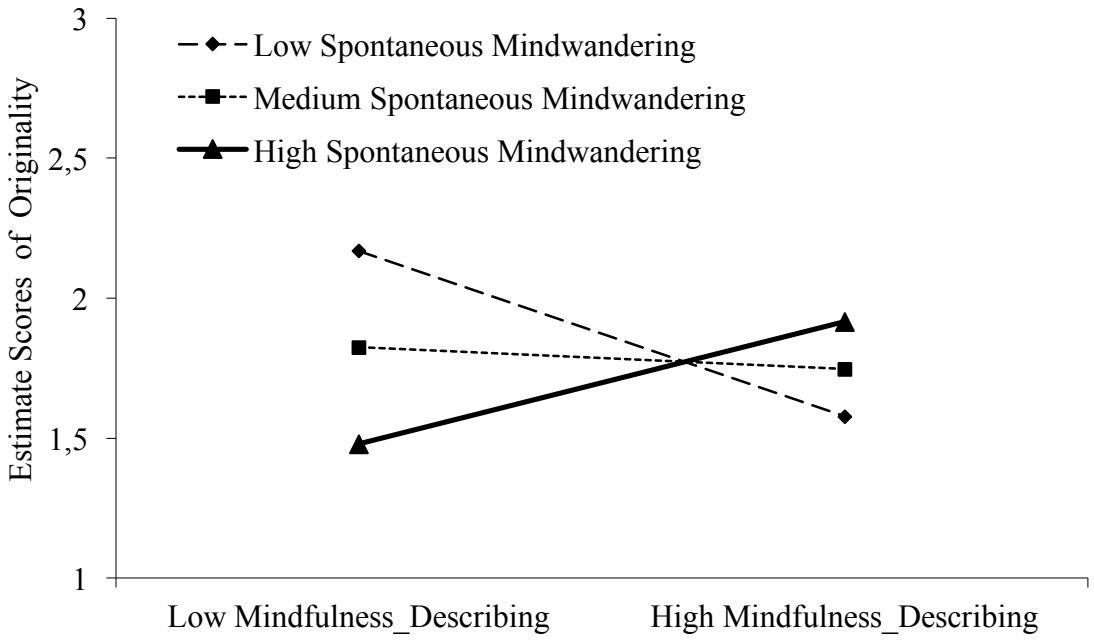
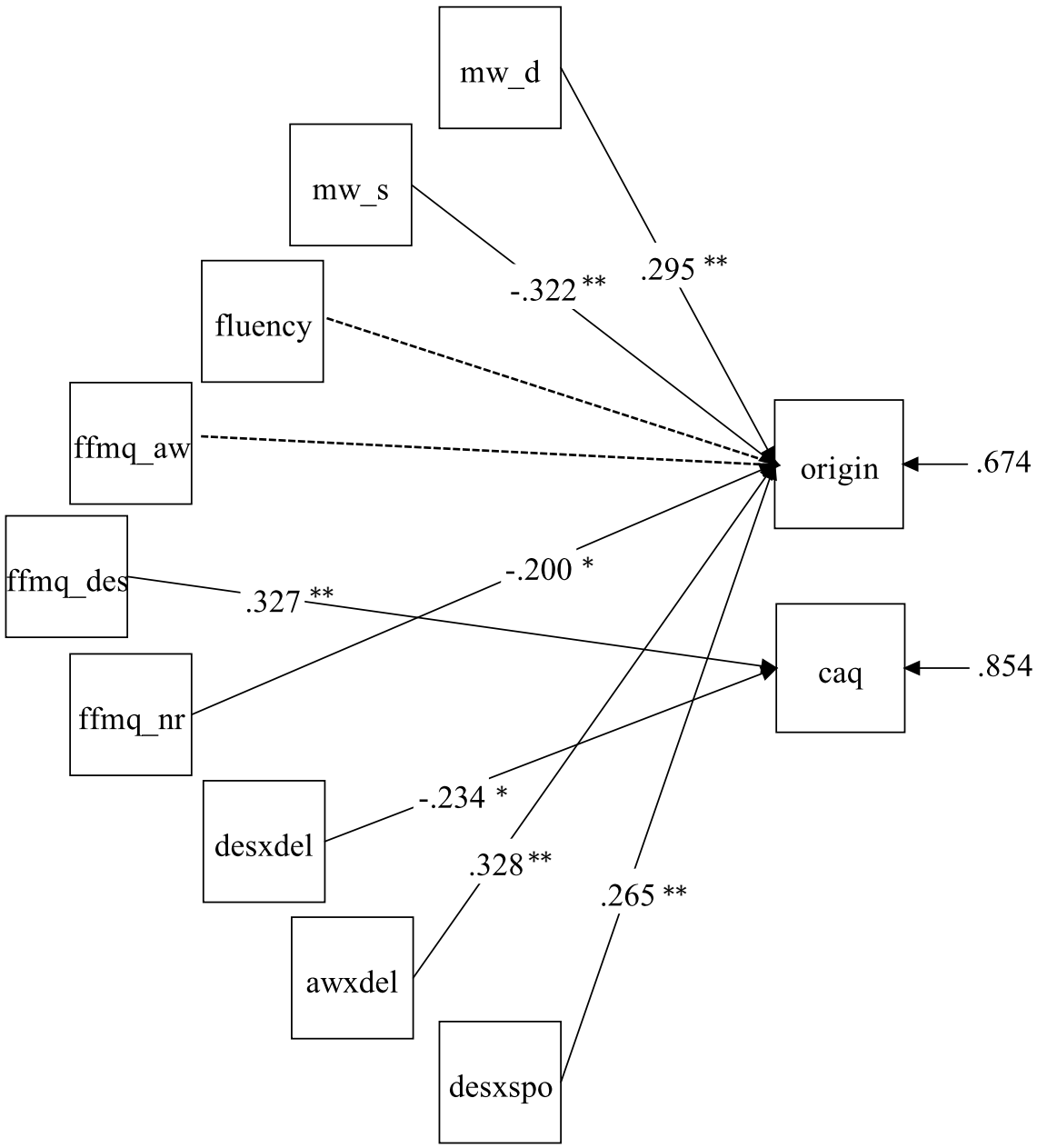

3
2,5
2
1,5
1
Estimate Scores of Originality
Low Spontaneous Mindwandering
Medium Spontaneous Mindwandering
High Spontaneous Mindwandering
Low Mindfulness_Describing
High Mindfulness_Describing

Figure 4


mw_d
mw_s
fluency
ffmq_aw
ffmq_des
ffmq_nr
desxdel
awxdel
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origin
caq
.674
.854
.295 **
-.322 **
-.200 *
.327 **
-.234 *
.328 **
.265 **