The Creative Mind in Daily Life: How Cognitive and Affective Experiences Relate to Creative Thinking and Behavior

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Abstract:

Creativity has long been conceptually linked to experiences of emotion and mind wandering, yet these empirical relationships remain unclear, and few studies have explored the thoughts and emotions of creative people in daily life. To investigate how creativity relates to everyday cognitive and affective experiences, the present study (N = 159) used experience sampling to examine how creative cognition (divergent thinking ability) and creative behavior (self-reported creative activity and achievement) measured in the lab may predict thought content, affective state, and the frequency of mind wandering (i.e., task-unrelated thought) in daily life. Additionally, we assessed in-the-moment thoughts and emotions predictive of thinking about a creative project in everyday life (i.e., "creative project thought"). We found that each form of creativity was generally associated with positively-valenced experiences, such as having pleasant thoughts, enjoying one's everyday activities, and feeling motivated and inspired. We also found that positive, activating emotions (happy and energetic) were positively associated with divergent thinking ability and in-the-moment creative project thought. Furthermore, positive, deactivating emotions (relaxed and connected) negatively predicted momentary creative project thought—indicating that positive affect can be tied to less creative thinking, depending on the activation level of emotions. No relationship was found between daily-life mind wandering frequency and divergent thinking ability or creative behavior/achievement, suggesting that the overall amount of task unrelated thought in everyday life is not related to individual creativity. Taken together, the present findings provide novel evidence on the everyday experiential correlates of creative thinking and behavior.

Keywords: creative behaviors | divergent thinking | emotion | experience sampling | mind wandering

Article:

Creativity has broadly been linked to cognitive experiences (i.e., thoughts; Zedelius et al., 2021) and affective experiences (i.e., emotions; Amabile et al., 2005). Because creativity comes in many forms, it has several scientific operationalizations, such as creative cognition (e.g., divergent thinking ability) and creative behavior (e.g., creative activities and achievements). However, the ways in which the types of thoughts and emotions that people experience in daily life relate to

creative thinking and behavior remain unclear. Specifically, positive affect and mind wandering (off-task thought) have been positively linked to creativity (Baas et al., 2008; Gable et al., 2019), but these relationships are not straightforward and may depend on many factors, such as the type of creativity, mind wandering, and emotion (Baas et al., 2011; Smeekens & Kane, 2016; Zedelius et al., 2021). Furthermore, little work has explored these relationships in the context of daily life, or for multiple operationalizations of creativity. In the present study, we examined how laboratory assessments of divergent thinking ability (specifically, the ability to generate creative alternate uses for common objects) and creative behavior (measured via self-reports of creative activity and achievement) may predict the types of thoughts and emotions that people commonly experience in daily life. Additionally, we examined how momentary thoughts and emotions predict real-world thinking about a creative project (i.e., "creative project thought"). This approach allowed us to study how the creative mind—at both the trait-level and in the moment—relates to everyday cognitive and affective experiences.

Creativity and Emotion

Positive affect has widely been found to improve performance on a variety of cognitive tasks (Ashby et al., 1999), but there are competing theories of how affect influences creativity (Baas et al., 2011; Ivcevic & Hoffmann, 2017). Much previous work has focused on valence—comparing the effects of positive and negative emotions on creativity. The valence hypothesis claims that positive affect fosters greater creativity than does negative or neutral affect (Baas et al., 2008; Gasper & Middlewood, 2014). Positive affect is thought to increase the number and breadth of cognitive elements considered relevant to a given task (i.e., scope of attention and cognition), as well as to increase cognitive flexibility, thus improving the likelihood of novel conceptual combination—which underlies creative cognition (Amabile et al., 2005; Fredrickson, 2001; Isen, 1999). Indeed, evidence has largely supported this view, including several studies demonstrating that induced positive affect enhances creative thinking ability (Gasper, 2004; Isen et al., 1987). Relatedly, a meta-analysis on early studies of mood and creativity found that positive affect was consistently linked to higher creativity, whereas no consistent effects were found for negative or neutral affect (Baas et al., 2008). Furthermore, in a daily life study of creativity in the workplace, Amabile et al. (2005) found that positive affect tended to precede creative thought, while negative affect did not. Similarly, another study examining everyday creativity found that when people were doing something creative in daily life, they reported feeling significantly happier and more active (Silvia et al., 2014). However, some evidence suggests that solely considering valence fails to capture the complexity of the relationship between creativity and affect (Baas et al., 2011; Gasper & Middlewood, 2014).

Beyond valence, other affective dimensions include activation (activating/deactivating), which refers to the level of attention and arousal produced by the affective state, and orientation (approach/avoidance), which refers to the focus of an affective state in approaching reward or avoiding threat (Gasper & Middlewood, 2014). There is some evidence that the creativity–affect relation may depend on activation and orientation, in addition to valence. For example, Baas et al. (2008) found in their meta-analysis that creativity benefited more from positive affective states that were activating (i.e., high activation level) and associated with approach motivation (e.g., happiness) than those which were deactivating (i.e., low activation level) and associated with avoidance motivation (e.g., relaxed). Additionally, negative affective states that were activating and associated with avoidance (e.g., anxiety), were negatively related to creativity, whereas those

which were deactivating with an avoidance motivation (e.g., sadness) were not associated with creativity. A daily diary study found similar results when exploring these relationships in daily life—that high-activation positive emotions (e.g., energetic) were the most beneficial to everyday creativity, while medium-activation positive emotions (e.g., happiness) were also beneficial to creativity, although not as strongly (Conner & Silvia, 2015). Similarly, another study on everyday creativity observed positive associations with positive, activating emotions and negative associations with negative, deactivating emotions (Han et al., 2019). Furthermore, experiences of positive, activating emotions have also been found to predict daily creative behavior (Karwowski et al., 2017).

Certain negative emotions have also been positively linked to creativity, such as anger, which may contribute to creativity in a similar way as happiness by activating and triggering approach with relatively unstructured cognitive processing (Baas et al., 2011). Interestingly, although both anger and happiness can improve creativity initially, they often lead to lower levels of creativity later in the task, suggesting that activating affective states, positive or negative, may deplete resources and thus impair creativity over longer tasks (Baas et al., 2008, 2011). Furthermore, approach orientation has been found to promote associative cognition (Gasper & Middlewood, 2014), which is a crucial component of creativity (Mednick, 1962). Taken together, these findings suggest that solely focusing on valence may not be an effective method of capturing the relationship between creativity and emotion, which may depend on activation and orientation. Further investigation into how specific types of emotions relate to creativity is needed. Therefore, the present study examined how creativity measured in the lab (i.e., divergent thinking ability and self-reported creative behavior) predicts a variety of affective states experienced in daily life, and how such states predict everyday creative thinking (i.e., thoughts related to a creative project) in the moment.

Creativity and Mind Wandering

In addition to affective experiences, cognitive experiences have also been related to creativity, most commonly in the context of mind wandering—internally-focused, self-generated cognition occurring with the disengagement of attention from the current situation. Mind wandering is a prevalent and complex phenomenon that has been linked to both positive and negative effects on cognition and emotion (Mooneyham & Schooler, 2013; Schooler et al., 2014). Creativity may benefit from mind wandering when one "hits a wall" in trying to solve a difficult task (i.e., impasse), as taking a break to let the mind wander may facilitate creative insight and problem solving (Baird et al., 2012; Gable et al., 2019; Sio & Ormerod, 2009; Tan et al., 2015). The associative theory of creativity posits that creativity involves combining remote concepts in novel and useful ways (Mednick, 1962), so the more distant the associations, the more novel their combination will be. One method by which mind wandering may benefit creativity, then, is through expansion of associative memory search (Agnoli et al., 2018; Baird et al., 2012). Specifically, when faced with an impasse on a problem or fixation—the influence of prior information—letting one's mind wander to concepts more distantly associated with the task may increase the probability of making novel and relevant associations (known as the spreading activation hypothesis; Sio & Rudowicz, 2007; Smith, 1995).

For example, Baird et al. (2012) found that retrospectively reporting higher levels of mind wandering during an undemanding task in an incubation period—a break from performing a certain cognitive task—was associated with improved performance on previously encountered

divergent thinking measures, relative to a demanding task or no task. This is consistent with a prior meta-analysis showing that compared with no task, engaging in an undemanding task during an incubation period led to stronger improvements in insight and problem solving (Sio & Ormerod, 2009). Relatedly, Tan et al. (2015) found that individuals who gained insight on a problem mind wandered significantly more during an incubation period (while engaging in a moderately demanding attention task) than those who did not gain insight and failed to solve the problem. Furthermore, Gable et al. (2019) extended previous laboratory-based findings to daily life and found that ideas which were generated during mind wandering were more likely to be labeled "aha" moments and associated with overcoming an impasse on a problem, compared with ideas generated on-task (although the former ideas were not rated as more creative than the latter). Additionally, historical accounts of creative individuals often cite periods of off-task thought as sources of creative inspiration (Ritter & Dijksterhuis, 2014; Wallas, 1926), including reports of important scientific insights which spontaneously came to the minds of scientists while not actively engaged in their scientific work. Such spontaneous insights are broadly seen as important to the creative process (Kounios & Beeman, 2014). Taken together, it seems that insight and creative problem solving can benefit from mind wandering during an incubation period, perhaps by increasing access to more distant, relevant associations. The evidence that creativity may benefit from mind wandering leads to the apparently paradoxical conclusion that both attention control (e.g., trying to solve a problem) and mind wandering are involved in creative cognition.

Although mind wandering during an incubation period has been associated with enhanced creative insight and problem solving, there's mixed evidence on if and how creativity specifically benefits from mind wandering, as other studies have found no relationship between mind wandering and divergent thinking (Murray et al., 2021; Smeekens & Kane, 2016; Steindorf et al., 2021; Zedelius et al., 2021). Importantly, mind wandering has been characterized as a failure of attention control and linked to lower executive control ability in some contexts (Frith et al., 2021; McVay & Kane, 2010; Mooneyham & Schooler, 2013). The dual-process theory of creativity highlights that creative cognition involves a balance of spontaneous associative and controlled executive cognitive processes (Beaty et al., 2014, 2021; Finke et al., 1992). Because creative thinking is associated with several aspects of executive control, including maintenance of internally focused attention (Beaty et al., 2019a; Beaty et al., in press; Benedek & Fink, 2019), if mind wandering reflects a failure of executive control, then it may actually be detrimental to creativity (Hao et al., 2015). Previous studies have tied mind wandering frequency to performance deficits in a variety of cognitive tasks, including several lab-based measures of attention (Frith et al., 2021; Smallwood et al., 2004). For example, Frith et al. (2021) recently found that mind wandering frequency during attention tasks (Stroop and SART) was negatively correlated with attention control, consistent with prior work (Kane et al., 2016). Thus, when task demands require focused attention, mind wandering is generally detrimental to performance on cognitive tasks, as task-irrelevant thoughts may divert attention (Frith et al., 2021; Smallwood & Schooler, 2006). Therefore, the evidence suggests that mind wandering, especially during demanding tasks, can represent a failure of executive control, and thus may impair creative cognition, which relies on executive control processes.

On balance, mind wandering can apparently help creativity (when it promotes novel associations and insight) or hurt creativity (when it reflects a failure of executive control). Moreover, the creativity–mind wandering literature contains seemingly conflicting findings, perhaps in part because of different definitions and measures of mind wandering (Agnoli et al., 2018; Gross et al., 2021; Smallwood & Schooler, 2006) and different measures of creativity (e.g.,

divergent thinking, creative behavior, insight, etc.). For example, Smeekens and Kane (2016), Steindorf et al. (2021), and Murray et al. (2021) found that the frequency of mind wandering (i.e., task-unrelated thought; TUT) during incubation was unrelated to postincubation divergent thinking performance, results that conflict with the findings of Baird et al. (2012). Furthermore, evidence suggests that mind wandering measured in laboratory settings may meaningfully differ from mind wandering experienced in daily life. Kane et al. (2017) demonstrated that attention and working memory capacity predicted mind wandering frequency in the lab, but only predicted mind wandering in daily life as a function of momentary concentration efforts; furthermore, whereas trait neuroticism (but not openness) predicted TUT rate in the lab, trait openness (but not neuroticism) predicted TUT rate in daily life. Similarly, another study found that SART performance did not predict mind wandering in daily life (Marcusson-Clavertz et al., 2016), even though a negative association has often been observed in laboratory settings (Frith et al., 2021). With conflicting findings between laboratory and real-world settings, the present study aimed to clarify the relationship between mind wandering and creativity by examining how creative cognition and creative behavior relate to the frequency of mind wandering in daily life.

The Present Research

Because it remains unclear how creativity relates to mind wandering and affective experiences, the present study aimed to clarify these relationships by characterizing the types of naturally occurring thoughts and emotions that creative people tend to experience in daily life, and examining these relationships for different operationalizations of creativity. Using experience sampling over the course of 1 week, the present research examined whether individual creativity measured in the lab—defined as both creative behavior/achievement and divergent thinking ability—relates to how often the mind wanders, the content of thoughts, and the quality of emotions in daily life. We also assessed the types of momentary experiences associated with real-world creative project thought and mind wandering (i.e., TUT). This approach allowed us to investigate how affective and cognitive experiences in daily life relate to creative thinking and behavior—specifically exploring the roles of emotional valence and mind wandering frequency.

To accomplish this goal, we used experience sampling methods (ESM; Silvia & Cotter, 2021). Using a smartphone app, we delivered surveys assessing participants' thoughts and emotions, at several points throughout the day, each day for 1 week. We then related the daily-life results to latent variables of creative cognition and creative behavior, consisting of measures of divergent thinking and creative behavior/achievement, respectively, that participants completed in the lab. How creativity predicts experiences and traits is an understudied question—for example, a review of 200 creativity studies found that only 20% used creativity as a predictor variable, whereas 72% used it as a dependent variable (Forgeard & Kaufman, 2016). Thus, the present study examined how creativity measured in the lab may predict the types of thoughts and emotions experienced in daily life, including mind wandering. In addition to mind wandering and other thought content items (e.g., whether thoughts were dreamlike or interesting), we also asked participants to report whether their thoughts were related to a creative project (i.e., "creative project thought"). We then conducted within-person analyses to assess how cognitive and affective experiences may predict real-world creative project thought in the moment (because this is a new measure of creativity, we decided to examine predictors of this variable). We also conducted within-person analyses to investigate the types of daily life experiences predictive of TUT,

allowing us to study how momentary mind wandering relates to everyday creative activity and other experiences relevant to creativity (e.g., feeling inspired).

The present study was exploratory, so we had no explicit hypotheses regarding differences between creative cognition and creative behavior in their associations with daily thoughts and emotions—only the general hypothesis that their associations would be largely, but not completely, similar, given the established relationship between divergent thinking and creative behavior. However, we expected that each form of creativity would be positively associated with feeling happy and energetic (positive, activating emotions), and negatively associated with feeling sad and tired (negative, deactivating emotions), based on previous research (e.g., Baas et al., 2008; Conner & Silvia, 2015; Han et al., 2019). We had no other specific hypotheses regarding creativity and emotion, or the associations between creative project thought and cognitive experiences. In line with existing evidence (e.g., Kane et al., 2007, 2017; Killingsworth & Gilbert, 2010), we expected momentary mind wandering to be primarily associated with negative thoughts and emotions. Owing to the complex and conflicting evidence on mind wandering and creativity, and theoretical reasons to believe that mind wandering can either help or hurt creativity, we had no explicit hypotheses regarding how everyday mind wandering frequency would relate to creative cognition and creative behavior. In sum, the present study aims to identify how divergent thinking, creative behavior, and momentary creative project thought relate to everyday cognitive and affective experiences.

Method

Participants

Participants were recruited as part of a larger project on creativity, personality, and cognitive ability (see Beaty et al., 2018; Frith et al., 2021; Maillet et al., 2018). Participants responded to flyers posted around the University of North Carolina at Greensboro (UNCG) campus. They were invited to participate in three phases of data collection (brain imaging, experience sampling, and behavioral assessment) and were paid up to $100 based on their level of completion (brain data not presented here, see Beaty et al., 2018). We also attempted to recruit musicians, artists, and their friends to obtain greater sample variation in creativity. Participants gave written informed consent, and the study was approved by the UNCG Institutional Review Board. The total sample consisted of 177 participants. Participants who completed an average of less than one survey per day during experience sampling were excluded from the present analyses (Silvia et al., 2014), yielding a final sample of 159 (mean age = 22.5; 112 women). Furthermore, to address the common issue of careless responding in survey data, we removed an additional 20 ESM surveys with exceptionally low variances (i.e., zero or near-zero variance reflecting selection of the same choice for each item), in line with previous approaches (Kane et al., 2017). The final dataset included over 4,200 surveys detailing the thoughts and emotions of people in everyday life. All the data from the present study is permanently and openly available via the Open Science Framework (OSF) at: https://osf.io/5un7s/.

Note that Maillet et al. (2018) reported mind-wandering (and other experience-sampling) data from a small subset of the present sample and compared them with an older adult sample but did not examine creativity. Frith et al. (2021) and Beaty et al. (2018) reported creative cognition and creative behavior laboratory data from the full sample but did not examine the experience sampling data.

Procedure

The first phase of data collection involved completing brain scans and a series of behavioral measures on a computer in a laboratory. Participants completed consent forms and were given instructions by an experimenter on the purpose and procedure of the study, including an overview of the experience sampling method and a tutorial on how to respond to survey questions.

Creative Behaviors

Participants completed several self-report measures of creative activity and achievement during behavioral assessment in the lab. The Biographical Inventory of Creative Behaviors (BICB) presents a list of 34 creative activities (e.g., writing a short story) and asks participants to indicate whether they engaged in that behavior within the past year (yes/no response); a total score is derived by summing across the 34 items (Batey, 2007; Silvia et al., 2021). The Creative Achievement Questionnaire (CAQ) asks participants to indicate their level of accomplishment within ten creative domains (e.g., creative writing; "My work has been sold publicly"); each achievement is weighted according to domain relevance, and a total score is derived by summing the summed domain scores (Carson et al., 2005). The Inventory of Creative Activities and Achievements (ICAA) includes two scales: one for activities (e.g., music; creating a melody) and one for achievements (e.g., winning an award for original work); an activities score is computed by averaging across domains and an achievements score is computed by summing across domains (Diedrich et al., 2018).

Creative Cognition

In the lab, participants completed two versions of the Alternate Uses task (AUT), a widely used measure of divergent creative thinking, which requires production of novel uses for common objects (Guilford, 1967). In one version of the AUT, participants had 2 min to generate many creative uses for an object by typing their responses into a text field via MediaLab experiment software—this version was run twice using different objects (i.e., "box" and "rope") during behavioral assessment. The other version was administered during neuroimaging as part of a larger project (see Beaty et al., 2018), in which participants were given 15 seconds per object to produce one alternate use for 23 objects (responses were spoken into an MRI-compatible microphone and logged by an experimenter; Benedek et al., 2014). Participants also completed a semantic control task during neuroimaging that was not analyzed here (see Beaty et al., 2018).

Prior to administration of the AUT, an experimenter explained the instructions for the task, and participants were given several practice trials. In both versions of the AUT, participants were instructed to "be creative" and "to come up with something clever, humorous, original, compelling, or interesting" (Nusbaum et al., 2014), consistent with best practices in assessing divergent thinking ability (Acar et al., 2020; Said-Metwaly et al., 2020). To assess the creative quality of the ideas produced, we used the commonly used subjective scoring approach (Silvia et al., 2008) to assign an originality rating to each response. Before such scoring occurred, participants' responses were anonymized and merged into a single file, so the scoring protocol was blinded. Four trained raters (with expertise in creativity rating, including two of the authors) provided originality ratings for AUT responses using a Likert-type rating scale of 1 (not at all creative) to 5 (very creative;

Silvia et al., 2008). Interrater agreement was high across the three AUT administrations: MRI (α = .93), box (α = .89), and rope (α = .93).

Experience Sampling Method

For 1 week, we used a smartphone app to send participants several surveys per day to assess the types of thoughts and emotions that people tend to experience in their daily lives. While in the lab, participants were asked to download the MetricWire ESM application on their smartphones (iPhone or Android). Participants who did not have a smartphone to use for the study were provided with a 7″ Android tablet with the MetricWire app preinstalled for the duration of the study. The experimenter explained to each participant that they would receive survey notifications on their device via the MetricWire app from 8 a.m. to midnight for the next seven days; the surveys occurred at quasi-random times, with at least 50 min separating any two surveys. Twelve surveys were sent per day on days 2–7, while the number of surveys sent on the first day of the study varied based on the time of day that participants came to the lab. Participants were asked to respond to as many surveys as possible but to avoid responding in situations that were inappropriate (e.g., class) or unsafe (e.g., driving) and to mute the device when sleeping. As a result, we did not expect participants to respond to all the surveys. An experimenter completed a practice survey with participants in the lab to ensure they understood how to respond. MetricWire signaled participants to complete a survey by sending a notification; when they received the notification, participants were asked to take stock of their current mental and emotional state just before they received the notification and to respond to all questions based on their current thoughts and emotions. Clicking the notification opened the MetricWire interface, which presented a series of questions prompting participants to respond using a sliding Likert scale. All data were transmitted to a secure online server. Participants had 5 min to respond to the notification after receiving it; otherwise, the notification would expire.

Table 1 lists all items included in the ESM survey. First, the survey asked participants to indicate whether they were currently mind wandering: “At the time of the beep, my mind had wandered to something other than what I was doing” (0 = no, 1 = yes; Kane et al., 2007, 2017). Next, the survey asked about temporal orientation of current thoughts (0 = past, 1 = present, 2 = future; the present option was endorsed if thoughts did not have a clear temporal direction; Beaty et al., 2019b). Then, the survey asked a series of questions about thought content; the stem “My thoughts were … ” preceded a series of 11 descriptions of the content and quality of one’s current thoughts (e.g., dreamlike, novel, interesting; 1 = not at all to 7 = very much). One survey item in this section asked whether one’s “thoughts were related to a creative project,” and this variable is how we operationalized creative project thought (note that everyday creativity is commonly measured with a single survey item; Conner & Silvia, 2015; Han et al., 2019; Silvia et al., 2014). The next part of the ESM survey inquired about behavioral activities; the stem “I was doing something … ” preceded five descriptions of one’s current activities (e.g., creative, enjoyable, challenging; 1 = not at all to 7 = very much). Because these are descriptions of behaviors, not actual behaviors (e.g., biking, eating, reading), these variables may broadly be considered as thoughts or feelings regarding one’s current activity (e.g., the experience of engaging in an activity that one finds enjoyable). Next, the survey asked about affective state; the stem “I was feeling … ” preceded a series of 15 descriptions of one’s current emotional state (e.g., sad, energetic, inspired; 1 = not at all to 7 = very much). Finally, the survey asked participants about their current social

Table 1.

Experience Sampling Survey

Thought Content and Activity Items
At the time of the beep, my mind had wandered to something other than what I was doing: Yes. No
My thoughts were mostly about ... the past; the present; the future
My thoughts were RELATED TO A CREATIVE PROJECT.
My thoughts were PLEASANT.
My thoughts were RACING.
My thoughts were DREAM-LIKE.
My thoughts were CLEAR
My thoughts were FUNNY
My thoughts were STRANGE.
My thoughts were NOVEL.
My thoughts were INTERESTING.
At the time of the beep, my thoughts had VISUAL IMAGES & PICTURES.
My thoughts had AUDITORY IMAGES & SOUNDS.
At the time of the beep, I was DOING SOMETHING CREATIVE.
I was DOING SOMETHING IMPORTANT.
I was DOING SOMETHING ENJOYABLE.
I was DOING SOMETHING CHALLENGING
I was DOING SOMETHING THAT I WANT TO DO
At the time of the beep, I was ... alone, by myself; with other people, but not interacting with them; interacting with other people.
Affect Items
At the time of the beep, I was feeling HAPPY.
I was feeling SAD.
I was feeling TIRED.
I was feeling MOTIVATED
I was feeling FRUSTRATED.
I was feeling ANXIOUS.
I was feeling INTERESTED.
I was feeling RELAXED.
I was feeling IN A STATE OF "FLOW."
I was feeling IRRITABLE.
I was feeling CONNECTED.
I was feeling ENERGETIC.
I was feeling GOOD AT WHAT I WAS DOING.
I was feeling INSPIRED.
I was feeling FOCUSED.

Note. 1–7 Likert scale unless otherwise noted (i.e., for mind wandering, temporal orientation of thoughts, and social engagement).

engagement (0 = alone, by myself, 1 = with other people, but not interacting with them, 2 = interacting with other people).

Analysis Plan

Using Mplus 8 (Muthén & Muthén, 2017), the four creative behavior scales were modeled as indicators of a latent "creative behavior" variable. As in past work, owing to the statistical rarity of high-level creative accomplishments in college samples, the Creative Achievement Questionnaire scores were log-transformed (Kenett et al., 2016; Silvia et al., 2012). Creativity ratings from the AUT were used to model a latent "creative cognition" variable, with the four raters serving as indicators of each AUT task (box, rope, and MRI) which were in turn indicators of a higher-order creative cognition variable. We chose this approach because latent variable modeling allows for the extraction of shared measurement variance among indicators and minimizes the amount of statistical "noise" (i.e., error variance) in the measures, providing better estimates of creative cognition and behavior. Figure 1 shows the latent variable modeling of creative cognition and creative behavior in a confirmatory factor analysis (cf. Beaty et al., 2018).

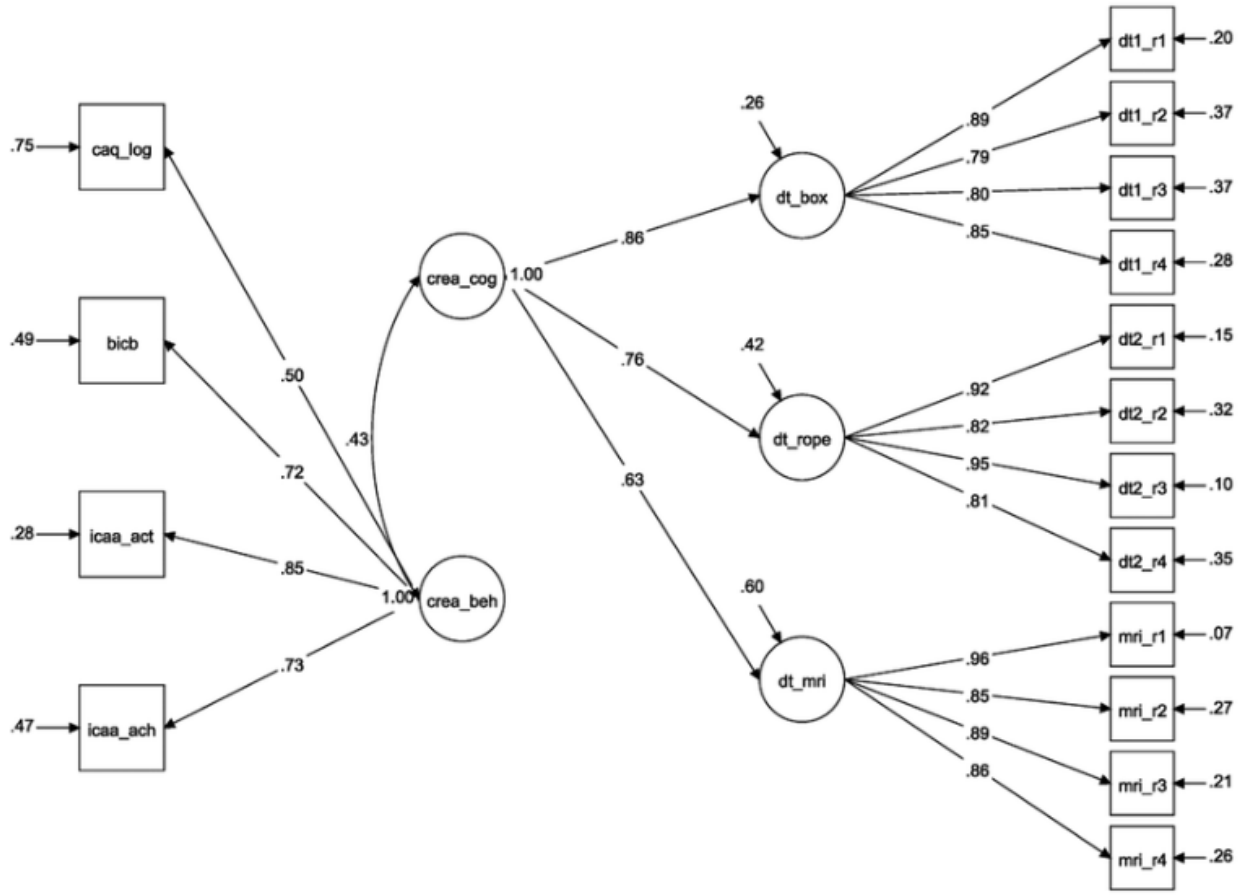

Figure 1. Note. Results are standardized. caq_log = Creative Achievement Questionnaire (log transformed); bicb = Biographical Inventory of Creative Behaviors; icaa_act = Inventory of Creative Activities and Achievements, Activities Subscale; icaa_ach = Inventory of Creative Activities and Achievements, Achievements Subscale; dt = divergent thinking; dt_box = AUT box prompt; dt_rope = AUT rope prompt; dt_mri = AUT during fMRI; r1–r4 = rater1–rater4; N = 159.

Our primary analytic goals were (a) to assess how creative cognition and behavior predict the types of thoughts and emotions experienced in daily life, including the frequency of mind wandering and (b) to identify the types of momentary thoughts and emotions predictive of thinking about a creative project and mind wandering in daily life. We thus began with a series of between-person regression analyses that modeled everyday cognitive and affective experiences as dependent variables, predicted by the latent creative behavior or creative cognition variables. Then, we conducted a series of within-person regression analyses with creative project thought and mind wandering as dependent variables in separate models, predicted by momentary daily life experiences. All regressions were random intercept models run using multilevel modeling. For both the within- and between-person analyses, we analyzed the following variables in separate models based on a priori classifications of the ESM data: mind wandering frequency, thought content, behavioral activities, affective state, temporal orientation of thoughts, and social engagement. Furthermore, the affective state variables were run in three separate models: positive emotions (happy, relaxed, connected, energetic), negative emotions (sad, tired, anxious, frustrated, irritated) and engagement-related emotions (motivated, interested, flow, inspired, focused, skilled). Engagement-related emotions are those that are not easily separable from one's behavior (i.e., feelings that are strongly tied to one's engagement in an activity)—for example, people who feel interested are generally interested in something, and those who feel motivated are often motivated to do something. For all analyses, individual ESM items were assessed, and no indices were formed from the ESM data, as our goal was to map specific experiential correlates of creativity and distinguish between a variety of similar experiences (e.g., how different types of positive emotions relate to creative cognition).

Using multilevel modeling, with maximum likelihood estimation and robust standard errors (MLR) in Mplus 8, within-person predictors were person-mean centered (at each individual's mean), while between-person predictors were centered at the grand mean of the sample (see Silvia & Cotter, 2021). For both within- and between-person analyses, we used the survey-level data. Additionally, for both between-person and within-person analyses, the social engagement and temporal orientation of thought variables were recoded as binary categorical variables and run in separate models, so each survey had a value for past, present, future, alone, social proximity, and social interaction of 0 or 1 (e.g., for past—0 indicates non–past-oriented thought, and 1 indicates past-oriented thought). Overall, this approach allowed us to uniquely examine how creative thinking and behavior relate to naturally occurring thoughts and emotions by assessing both within- and between-person models in relation to everyday experiences.

Results

Participants completed an average of about 27 surveys (M = 26.8, SD = 12.3) over the 1-week period. We found that the average frequency of mind wandering in daily life was around 38%, which is somewhat higher than the 30% to 32% reported previously for similar samples of young adults (Kane et al., 2007, 2017; McVay et al., 2009). This discrepancy may be attributable in part to the present study oversampling artists and musicians for the larger project, because such individuals may be above average in openness to experience, contributing to increased rates of daily-life mind wandering (Kane et al., 2017). Table 2 lists the descriptive statistics for all ESM items (see also Table 1 in the online supplemental materials for descriptive statistics of all creativity measures). Additionally, we report correlation matrices for the ESM items as well as creativity measures in Tables 2–5 in the online supplemental materials. To measure the average

Table 2. *Descriptive Statistics for All ESM Variables*

Variable	*M*	*SD*	*R* (Min-Max)	Skew	Kurtosis
Mind wandering	0.38	0.20	0.00–1.00	0.42	–0.40
Creative project	2.53	1.01	1.00–5.58	0.44	–0.60
Pleasant	4.39	0.91	1.18–6.38	–0.48	0.23
Racing	2.57	1.00	1.00–5.58	0.56	–0.16
Dreamlike	2.40	0.99	1.00–5.38	0.57	–0.47
Clear	4.65	0.93	2.38–6.83	0.12	–0.52
Funny	2.26	0.76	1.00–4.71	0.48	–0.29
Strange	1.90	0.77	1.00–4.12	0.90	0.05
Novel	2.30	0.99	1.00–5.13	0.74	–0.1
Interesting	3.75	0.99	1.04–5.81	–0.41	0.15
Visual imagery	4.02	1.28	1.09–6.69	–0.08	–0.96
Auditory sounds	3.14	1.23	1.00–6.41	0.44	–0.69
Past	0.07	0.09	0.00–0.64	2.76	12.13
Present	0.68	0.17	0.00–1.00	–0.46	0.86
Future	0.24	0.15	0.00–1.00	1.00	3.13
Creative activity	2.56	0.90	1.00–5.00	0.28	–0.62
Important activity	3.75	0.90	1.70–6.66	0.28	–0.11
Enjoyable activity	4.31	0.83	1.57–6.07	–0.44	0.34
Challenging activity	2.82	0.84	1.12–5.17	0.41	–0.44
Wanted activity	4.49	0.83	1.77–6.32	–0.38	0.52
Happy	4.45	1.00	1.58–6.24	–0.53	–0.08
Sad	1.77	0.67	1.00–4.62	1.50	2.87
Tired	3.39	1.08	1.11–6.13	0.19	–0.41
Irritable	2.06	0.76	1.00–5.12	1.11	1.16
Frustrated	2.24	0.78	1.07–4.62	0.81	0.00
Anxious	2.33	0.92	1.00–5.03	0.78	–0.09
Interested	3.82	0.98	1.00–5.78	–0.52	0.17
Motivated	3.28	0.97	1.00–5.22	0.01	–0.68
Relaxed	3.87	0.84	1.27–5.88	–0.35	0.33
Flow	3.30	1.19	1.00–6.42	0.06	–0.44
Connected	2.97	0.92	1.27–5.33	0.23	–0.42
Energetic	2.79	0.96	1.00–5.50	0.28	–0.38
Skilled	3.91	1.01	1.48–6.50	–0.04	–0.05
Inspired	2.91	1.04	1.00–5.20	0.20	–0.77
Focused	4.03	0.93	1.48–6.50	–0.07	–0.09
Alone	0.43	0.20	0.00–0.93	0.28	–0.41
Social proximity	0.25	0.13	0.00–0.62	0.40	–0.14
Social interaction	0.31	0.15	0.00–0.75	0.05	–0.46

Note. ESM = experience sampling methods. Results were calculated from averaged (short-form) ESM data. Creative Project = "My thoughts were related to a creative project" ESM item; Wanted Activity = "I was doing something that I want to do" ESM item; Skilled = "I was feeling good at what I was doing" ESM item; Social Proximity = "I was with other people, but not interacting with them" ESM item.

frequency of real-world creative thinking and behavior, we recoded the creative project thought and creative activity ESM items as binary variables (5–7 Likert rating = "1," 1–4 Likert rating = "0"). Consistent with previous work (Silvia et al., 2014), we found the average rate of engaging in creative activity to be around 20% (19.5%); similarly, the frequency of creative project thought was 21.7%. Thus, participants reported being creative for a considerable amount of time in daily life.

Because previous studies have found a "prospective bias" such that mind wandering primarily involves future-oriented thought (Baird et al., 2011; Smallwood et al., 2009), we calculated the percentage of past-, present-, and future-oriented thoughts when participants reported mind wandering. Our results provide further evidence of a "prospective bias," as the frequency of past-oriented thought when mind wandering was 11.6%, whereas the frequency of future-oriented mind wandering was 46.8%. Participants also reported having present-oriented thoughts (and thoughts without a strong temporal direction) 41.5% of the time that they reported mind wandering, highlighting how TUT is not equivalent to non–present-oriented thinking.

We specified a confirmatory factor analysis (CFA) to assess the correlation between creative cognition and creative behavior (see Figure 1). The CFA fit the data well: $\chi 2(100) = 121.917$, $p = .067$; CFI = .985; TLI = .982; RMSEA = .037; SRMR = .064. All factor loadings were significant at $p < .001$. Consistent with our prior analyses of these data (Beaty et al., 2018), we found the latent correlation to be large in magnitude: $r = .43$, $p = .001$. To avoid multicollinearity in the between-person regression analyses, creative cognition and creative behavior were run as predictors in separate models (however, for completeness, Table 6 in the online supplemental materials reports the results of between-person models which include both predictors).

Next, we examined between-person effects of creative behavior (measured in the lab with questionnaires) on thoughts and emotions in daily life. As with creative cognition, we found that creative behavior scores positively predicted creative project thought, engaging in creative and enjoyable activities, and feeling motivated, inspired, and skilled at one's everyday activities (see Table 4). However, no other associations were found between everyday emotions and creative behavior. Creative behavior also predicted having novel thoughts. Consistent with the results for creative cognition, creative behavior did not predict mind wandering frequency in daily life. Furthermore, no associations were found between temporal orientation of thoughts and creative behavior and cognition. Additionally, no associations were observed between social engagement and creative behavior and cognition, except for a surprising negative association between creative cognition and social proximity. Taken together, these findings provide new evidence on the types of thoughts and emotions that creative people tend to experience in daily life.

Within-Person Predictors of Momentary Creative Project Thought and Mind Wandering

In the within-person analyses, we assessed how daily life experiences may predict creative project thought and mind wandering in the moment. We found that momentary thinking about a creative project was positively predicted by having thoughts that were pleasant, novel, interesting, and those which contained visual imagery (see Table 5). Furthermore, in-the-moment creative project thought was positively predicted by feeling happy and energetic, and negatively predicted by feeling sad and tired—consistent with the between-person findings for divergent thinking ability. Interestingly, feeling relaxed and connected in the moment negatively predicted thinking about a creative project—evidence of positive, deactivating emotions being tied to less creative thinking.

Table 3. ESM Items Predicted by Creative Cognition Scores in Between-Person Analyses

Variable	Coefficient	*p* Value	[95% CI]
Creative project	0.220	.011	[0.051, 0.389]
Pleasant	0.197	.022	[0.029, 0.364]
Novel	0.077	.472	[–0.133, 0.288]
Racing	–0.003	.983	[–0.235, 0.230]
Dreamlike	0.032	.780	[–0.195, 0.259]
Clear	0.067	.435	[–0.101, 0.235]
Funny	–0.003	.972	[–0.180, 0.174]
Strange	–0.076	.421	[–0.260, 0.109]
Interesting	0.151	.148	[–0.054, 0.355]
Visual imagery	0.134	.130	[–0.040, 0.308]
Auditory Sounds	0.110	.225	[–0.068, 0.288]
Happy	0.141	.048	[0.001, 0.280]
Energetic	0.214	.030	[0.020, 0.408]
Relaxed	0.121	.181	[–0.056, 0.298]
Connected	0.145	.102	[–0.029, 0.318]
Sad	–0.190	.019	[–0.349, –0.031]
Tired	–0.195	.016	[–0.354, –0.037]
Frustrated	–0.092	.343	[–0.282, 0.098]
Anxious	–0.143	.164	[–0.345, 0.059]
Irritable	–0.107	.279	[–0.301, 0.087]
Motivated	0.198	.030	[0.019, 0.378]
Interested	0.227	.006	[0.065, 0.390]
Skilled	0.165	.037	[0.010, 0.321]
Inspired	0.210	.018	[0.036, 0.385]
Flow	0.033	.742	[–0.164, 0.230]
Focused	0.124	.177	[–0.056, 0.303]
Creative activity	0.237	.004	[0.077, 0.398]
Enjoyable activity	0.217	.007	[0.059, 0.376]
Wanted activity	0.200	.011	[0.046, 0.354]
Important activity	0.007	.939	[–0.182, 0.197]
Challenging activity	0.173	.085	[–0.024, 0.370]
Mind wandering	–0.102	.325	[–0.304, 0.101]
Past	0.072	.512	[–0.143, 0.287]
Present	–0.105	.350	[–0.324, 0.115]
Future	0.098	.428	[–0.144, 0.340]
Alone	0.183	.069	[–0.014, 0.380]
Social proximity	–0.276	.016	[–0.500, –0.051]
Social interaction	–0.065	.548	[–0.275, 0.146]

Note. ESM = experience sampling methods. All results are standardized. Bolded = statistically significant at $p < .05$. "Irritable" results are from a separate model than the other reported negative affect results. "Wanted Activity" results are from a separate model than the other reported activity results.

Table 4. *ESM Items Predicted by Self-Reported Creative Behavior in Between-Person Analyses*

Variable	Coefficient	*p* Value	[95% CI]
Creative project	0.252	.004	[0.081, 0.423]
Pleasant	0.191	.059	[–0.007, 0.389]
Novel	0.249	.013	[0.053, 0.445]
Racing	0.001	.996	[–0.195, 0.196]
Dreamlike	0.129	.186	[–0.062, 0.321]
Clear	0.036	.756	[–0.260, 0.189]
Funny	0.082	.444	[–0.127, 0.291]
Strange	0.170	.095	[–0.030, 0.369]
Interesting	0.190	.051	[–0.001, 0.381]
Visual imagery	0.118	.220	[–0.071, 0.307]
Auditory Sounds	0.179	.081	[–0.022, 0.380]
Happy	0.135	.154	[–0.050, 0.319]
Energetic	0.134	.156	[–0.051, 0.319]
Relaxed	0.153	.184	[–0.073, 0.379]
Connected	0.098	.339	[–0.102, 0.298]
Sad	–0.107	.318	[–0.317, 0.103]
Tired	0.017	.867	[–0.180, 0.213]
Frustrated	0.002	.981	[–0.192, 0.197]
Anxious	–0.078	.418	[–0.268, 0.111]
Irritable	0.003	.976	[–0.202, 0.209]
Motivated	0.182	.036	[0.012, 0.353]
Interested	0.176	.061	[–0.008, 0.360]
Skilled	0.227	.020	[0.036, 0.417]
Inspired	0.207	.020	[0.033, 0.381]
Flow	0.027	.777	[–0.160, 0.215]
Focused	0.019	.850	[–0.176, 0.214]
Creative activity	0.230	.013	[0.049, 0.410]
Enjoyable activity	0.287	.007	[0.078, 0.496]
Wanted activity	0.239	.026	[0.029, 0.449]
Important activity	–0.013	.903	[–0.220, 0.194]
Challenging activity	0.120	.229	[–0.075, 0.315]
Mind wandering	–0.059	.599	[–0.279, 0.161]
Past	0.092	.493	[–0.170, 0.354]
Present	–0.179	.117	[–0.404, 0.045]
Future	0.157	.205	[–0.086, 0.399]
Alone	0.061	.566	[–0.147, 0.269]
Social proximity	–0.085	.510	[–0.339, 0.168]
Social interaction	–0.010	.935	[–0.247, 0.227]

Note. ESM = experience sampling methods. All results are standardized. Bolded = statistically significant at $p < .05$. "Irritable" results are from a separate model than the other reported negative affect results. "Wanted Activity" results are from a separate model than the other reported activity results.

Momentary creative project thought was also positively predicted by feeling inspired and motivated, as well as with feeling focused and in a state of flow (Csikszentmihalyi, 1990). Additionally, when thinking about a creative project, people tended to describe their current activity as creative, important, and challenging. Creative project thought was also negatively associated with mind wandering; thus, the findings suggest that creative project thought primarily occurred while on-task during creative endeavors in daily life. A temporal effect was also observed, as thinking about a creative project in the moment was positively predicted by thinking about the future, and negatively predicted by thinking about the past. These results indicate that creative project thought tends to be future-oriented. Additionally, there was a social effect, as creative project thought was negatively predicted by social interaction and positively predicted by social proximity. Together, these findings identify the types of momentary experiences that are common during real-world creative thinking.

Finally, we examined how daily life experiences predict real-world mind wandering in the moment. We found that mind wandering was positively predicted by dreamlike thoughts, visual imagery, and feeling inspired, as well as with racing thoughts and feeling anxious (see Table 6). Conversely, mind wandering was negatively predicted by having pleasant and clear thoughts, as well as with feeling happy, connected, focused, and interested (cf. Kane et al., 2007, 2017). These findings highlight the complex nature of everyday mind wandering, as it is positively associated with both negatively-valenced and positively-valenced daily life experiences. We also found that mind wandering in the moment was positively predicted by both thinking about the future and the past, suggesting that mind wandering in daily life involves a balance of prospective and retrospective thinking. In line with previous studies on everyday mind wandering (Kane et al., 2007, 2017; McVay et al., 2009), we found that mind wandering was negatively predicted by thinking about the present, and engaging in enjoyable activities and activities which one wants to do. Furthermore, in contrast to some previous findings (Kane et al., 2017; McVay et al., 2009), we observed a social effect: daily-life mind wandering in the moment was positively predicted by being alone and negatively predicted by social interaction.

Discussion

What types of daily life experiences are associated with creative thinking and behavior? Previous evidence has suggested links with positive affect and mind wandering, yet little research exists on the everyday experiential correlates of creativity. Furthermore, how creativity relates to affect and mind wandering remains unclear, with conflicting findings and competing theories in the literatures. Thus, the present study used experience sampling to examine how divergent thinking ability, creative behavior/achievement, and momentary creative project thought relate to the types of thoughts and emotions experienced in daily life. Following previous work (Baas et al., 2011; Conner & Silvia, 2015; Gasper & Middlewood, 2014), we provide further evidence that the creativity-affect relation extends beyond valence, highlighting activation level as an important consideration in such research. Specifically, we found that divergent thinking ability and in-the-moment creative project thought were positively associated with positive, activating emotions, and negatively related to negative, deactivating emotions. Furthermore, positive, deactivating emotions were negatively associated with in-the-moment creative project thought. We also found that everyday mind wandering frequency—defined as thinking unrelated to what one was currently doing (i.e., TUT)—was not related to creative cognition or behavior. Moreover, there was a negative relationship between real-world thinking about a creative project and mind wandering in

Table 5. *Within-Person Predictors of Creative Project Thought*

Variable	Coefficient	*p* Value	[95% CI]
Mind wandering	–0.195	.018	[–0.357, –0.033]
Pleasant	0.179	<.001	[0.124, 0.234]
Novel	0.210	<.001	[0.132, 0.287]
Racing	0.138	<.001	[0.083, 0.193]
Dreamlike	–0.025	.318	[–0.074, 0.024]
Clear	0.029	.201	[–0.015, 0.074]
Funny	–0.160	<.001	[–0.214, –0.106]
Strange	–0.054	.088	[–0.115, 0.008]
Interesting	0.198	<.001	[0.145, 0.251]
Visual imagery	0.089	<.001	[0.043, 0.135]
Auditory sounds	0.010	.646	[–0.033, 0.054]
Happy	0.150	<.001	[0.101, 0.200]
Energetic	0.169	<.001	[0.112, 0.226]
Relaxed	–0.052	.022	[–0.097, –0.007]
Connected	–0.079	.001	[–0.123, –0.034]
Sad	–0.096	<.001	[–0.150, –0.043]
Tired	–0.066	.001	[–0.106, –0.025]
Frustrated	0.025	.320	[–0.024, 0.073]
Anxious	0.021	.492	[–0.038, 0.080]
Irritable	–0.052	.055	[–0.105, 0.001]
Motivated	0.172	<.001	[0.131, 0.213]
Interested	0.035	.103	[–0.007, 0.077]
Skilled	0.006	.797	[–0.039, 0.051]
Inspired	0.293	<.001	[0.223, 0.362]
Flow	0.067	.010	[0.016, 0.118]
Focused	0.062	.013	[0.013, 0.111]
Creative activity	0.567	<.001	[0.509, 0.625]
Enjoyable activity	0.020	.158	[–0.008, 0.043]
Wanted activity	0.008	.560	[–0.020, 0.037]
Important activity	0.060	<.001	[0.027, 0.093]
Challenging activity	0.072	.003	[0.025, 0.119]
Past	–0.567	<.001	[–0.815, –0.319]
Present	–0.168	.052	[–0.336, 0.001]
Future	0.397	<.001	[0.225, 0.569]
Alone	0.020	.797	[–0.131, 0.171]
Social proximity	0.227	.005	[0.067, 0.386]
Social interaction	–0.218	.007	[–0.377, –0.059]

Note. All results are unstandardized. Bolded = statistically significant at $p < .05$. "Irritable" results are from a separate model than the other reported negative affect results. "Wanted Activity" results are from a separate model than the other reported activity results.

Table 6. *Within-Person Predictors of Mind Wandering*

Variable	Coefficient	*p* Value	[95% CI]
Creative project	–0.066	.022	[–0.123, –0.010]
Pleasant	–0.121	<.001	[–0.180, –0.062]
Novel	0.026	.480	[–0.045, 0.097]
Racing	0.121	<.001	[0.068, 0.175]
Dreamlike	0.303	<.001	[0.246, 0.359]
Clear	–0.145	<.001	[–0.211, –0.079]
Funny	–0.009	.767	[–0.065, 0.048]
Strange	–0.026	.503	[–0.102, 0.050]
Interesting	–0.015	.627	[–0.078, 0.047]
Visual imagery	0.106	<.001	[0.055, 0.157]
Auditory sounds	0.046	.092	[–0.007, 0.099]
Happy	–0.101	.001	[–0.161, –0.041]
Energetic	0.038	.222	[–0.023, 0.098]
Relaxed	–0.019	.461	[–0.069, 0.031]
Connected	–0.051	.014	[–0.092, –0.010]
Sad	0.046	.204	[–0.025, 0.117]
Tired	0.035	.128	[–0.010, 0.080]
Frustrated	<.001	1.00	[–0.064, 0.064]
Anxious	0.130	<.001	[0.075, 0.185]
Irritable	0.046	.114	[–0.011, 0.103]
Motivated	0.011	.635	[–0.036, 0.059]
Interested	–0.100	<.001	[–0.154, –0.046]
Skilled	–0.014	.637	[–0.070, 0.043]
Inspired	0.102	.001	[0.042, 0.162]
Flow	–0.048	.073	[–0.101, 0.004]
Focused	–0.198	<.001	[–0.269, 0.127]
Creative activity	–0.034	.221	[–0.088, –0.020]
Enjoyable activity	–0.096	<.001	[–0.138, –0.054]
Wanted activity	–0.109	<.001	[–0.149, –0.068]
Important activity	–0.027	.324	[–0.081, 0.027]
Challenging activity	–0.030	.256	[–0.081, 0.022]
Past	1.111	.001	[0.727, 1.496]
Present	–2.008	.001	[–2.272, –1.744]
Future	1.833	.001	[1.584, 2.083]
Alone	0.203	.012	[0.044, 0.361]
Social proximity	0.076	.365	[–0.088, 0.240]
Social interaction	–0.290	.001	[–0.457, –0.123]

Note. All results are unstandardized. Bolded = statistically significant at $p < .05$. "Frustrated" results are from a separate model than the other reported negative affect results. "Enjoyable Activity" results are from a separate model than the other reported activity results.

the moment. Overall, creativity was tied to experiencing positively-valenced thoughts and emotions in daily life, such as having pleasant and novel thoughts, enjoying one's everyday activities, and feeling motivated and inspired. Taken together, the findings provide novel evidence regarding how creative thinking and behavior relate to naturally occurring cognitive and affective experiences in daily life.

Creativity and Everyday Thoughts and Emotions

Creativity research has explored both creative cognition (i.e., divergent thinking ability) and creative behavior (self-report measures of the frequency and proficiency of creative activity). Previous evidence suggests that the two constructs are related ($r = .54$; Beaty et al., 2018), but reported differences in their cognitive and behavioral correlates suggest they may also be somewhat distinct (Zabelina & Ganis, 2018; Zedelius et al., 2021). For example, Zabelina and Ganis (2018) found that divergent thinking ability was linked to greater cognitive control, while creative behavior was not. Regarding mind wandering, Zedelius et al. (2021) found that personally meaningful and fantastical mind wandering (as a trait-level individual difference) was linked to creative behavior, whereas no associations were observed between mind wandering and divergent thinking ability. To our knowledge, the present study is the first to explore how creative cognition and behavior relate to a range of affective and cognitive experiences in daily life. Furthermore, the present study also introduced a new operationalization of real-world creative thinking—thinking about a creative project in everyday life (i.e., creative project thought)—and examined its associations with momentary emotions and thoughts. Notably, compared with divergent thinking ability, creative project thought primarily measures the experience of creative thinking rather than creative thinking performance or ability (much like real-world creative activity, it is a measure of frequency, not proficiency).

As expected, laboratory-assessed creative cognition and creative behavior showed largely, but not completely, overlapping associations with thoughts and emotions experienced in daily life. Perhaps the most striking difference we observed in their associations was that divergent thinking positively predicted feeling happy and energetic, and negatively predicted feeling sad and tired, whereas no associations were observed between creative behavior and these emotions. That creative thinking ability is linked to positive, activating affect is consistent with previous studies on cognition (Ashby et al., 1999; Fredrickson, 2001) and creativity (Amabile et al., 2005; Baas et al., 2008; Isen, 1999). We suggest that, unlike divergent thinking, the associations between creative behavior and certain emotions may be relatively domain-specific—for example, perhaps sadness relates differently to artistic and scientific creativity. Because the present study investigated domain-general creative behavior, such effects could not be observed.

Importantly, when people reported thinking about a creative project in daily life, they were less likely to be feeling relaxed and connected, and more likely to be feeling happy and energetic. Thus, real-world creative thinking in the moment was positively predicted by positive, activating emotions and negatively predicted by positive, deactivating emotions. This is further evidence that the relationship between creativity and affect cannot be explained solely by valence, as positive emotions related differently to creative thinking based on their level of activation (cf. Conner & Silvia, 2015; Karwowski et al., 2017). We also found that creative project thought was positively associated with visual imagery and interesting thoughts, as well as with feeling focused and in a state of flow (Csikszentmihalyi, 1990). These results provide evidence of the experience of thinking about a creative project in everyday life. Some daily life experiences were positively

linked to all three forms of creativity, such as feeling motivated and inspired (positive and activating engagement-related emotions) and engaging in creative activities. Overall, creativity was generally associated with positively-valenced cognitive and affective experiences in daily life. Altogether, these findings describe the everyday experiential correlates of divergent thinking ability, creative behavior/achievement, and momentary creative project thought.

Creativity and Mind Wandering

Because creativity involves connecting distantly associated concepts in novel and useful ways, mind wandering may benefit creativity by increasing the scope of associative memory search, especially in the context of incubation periods, enhancing insight and creative problem solving (Baird et al., 2012; Gable et al., 2019; Sio & Ormerod, 2009; Tan et al., 2015). However, creativity also relies on executive control processes (Beaty et al., 2019a; Benedek & Fink, 2019), and mind wandering can divert attentional focus, thus impairing creative performance (Frith et al., 2021; Hao et al., 2015). Therefore, to the extent that mind wandering reflects a failure of attention control, it may be negatively related to creativity, but to the extent it improves associative processing, it may be positively related to creativity.

In the present study, we found no association between the amount of mind wandering in daily life and creative cognition or creative behavior, indicating that more creative people do not tend to mind wander at different rates than less creative people in everyday life. This suggests that any relationship between mind wandering and creativity is not driven by the overall amount of mind wandering in daily life. It remains possible, however, that the content and context of mind wandering (Agnoli et al., 2018; Zedelius et al., 2021), as well as individual-differences constructs related to mind wandering and creativity (e.g., personality, intelligence; Kane et al., 2017), may be crucial elements of any potential creativity–mind wandering relation. Furthermore, we found a negative relationship between creative project thought and mind wandering in the moment, such that when people were thinking about a creative project, they tended to not be mind wandering. Along with the positive relationship between creative project thought and everyday creative activity, we interpret this as evidence that most thoughts related to a creative project in daily life occurred while attentionally on-tas

Previous evidence has supported the notion that when mind wandering reflects a failure of executive control (e.g., occurring during demanding tasks), it is negatively related to creativity. For example, Hao et al. (2015) found that mind wandering frequency during idea generation was negatively related to idea originality, as those who mind wandered more (in a lab setting) generated less original ideas as time passed. These results suggest that the executive control processes involved in divergent thinking were disrupted as attention was redirected to off-task thought. Interestingly, Agnoli et al. (2018) showed that idea originality and creative behavior/achievement were negatively associated with unintentional mind wandering, but positively associated with intentional mind wandering. These findings suggest that mind wandering can involve deliberate relaxation of attention control, or unintentional attention control failure, and that these types of mind wandering may relate differently to creativity. Therefore, perhaps a simple measure of mind wandering frequency in daily life captures, but does not distinguish between, both intentional and unintentional forms of mind wandering which relate differently to creativity (Agnoli et al., 2018; Seli et al., 2018). Furthermore, people with greater control over their thoughts tend to mind wander more when they want to, such as during undemanding tasks, and less when external focus is needed (Kane et al., 2007, 2017; Levinson et al., 2012; but see Meier, 2019), both of which may enhance

creativity. This suggests that higher executive control (e.g., working memory capacity) may allow regulation of mind wandering based on the situation (e.g., how detrimental it would be)—which could improve (or hurt) creativity via influences on associative and executive processing. Thus, future studies should examine the roles of intentionality and momentary concentration efforts in the mind wandering-creativity relation.

In addition to individual differences and the context of mind wandering, the quality and content of mind wandering has also been shown to impact the relationship between creativity and mind wandering. For example, Zedelius et al. (2021) found no associations between divergent thinking and mind wandering, but specific types of mind wandering (i.e., fantastical and personally meaningful) were related to creative behavior. Altogether, the lack of an association between everyday mind wandering frequency and creative cognition and behavior observed in the present study may indicate that the relationship between creativity and mind wandering in daily life is too complex for simple yes/no measures of mind wandering (Seli et al., 2018), and that the context (e.g., task demands, intentionality) and content of mind wandering, as well as individual differences (e.g., attention control, personality) may be important considerations in understanding the true nature of this relationship. Furthermore, the type of creativity should also be considered; for example, mind wandering may relate more strongly to insight than divergent thinking. Thus, further specification of the content and context of mind wandering, form of creativity, and the role of individual differences, is needed to parse out how creativity and mind wandering may relate.

Mind Wandering and Daily Life Experiences

We found that mind wandering in the moment was positively predicted by feeling inspired—a positive, activating, engagement-related emotion which also positively predicted momentary creative project thought. These findings suggest that, despite the strong link between daily-life mind wandering and negative affect (Franklin et al., 2013; Kane et al., 2007, 2017; Killingsworth & Gilbert, 2010), mind wandering is not always (or not wholly) a negative experience. Previous evidence also supports this claim, such as the finding that while mind wandering is generally associated with negative mood, it is associated with positive mood when the thought content of mind wandering is interesting (Franklin et al., 2013). Similarly, Welz et al. (2018) found that greater mind wandering frequency in daily life predicted significantly lower subsequent negative affect when the thought content of mind wandering was pleasant. Notably, however, mind wandering measured in the present study was linked to having unpleasant thoughts and feeling uninterested. Overall, we found that daily-life mind wandering in the moment tended to be linked to negatively-valenced experiences but was also linked to some positively-valenced experiences.

We also found that everyday mind wandering involves both prospective and retrospective thinking, as both past- and future-oriented thought positively predicted mind wandering in the moment. Consistent with previous work (e.g., Baird et al., 2011), we also found evidence of a prospective bias, as everyday mind wandering was primarily future-oriented. Additionally, we found that people were more likely to mind wander when they were alone and less likely when engaging in social interaction (in contrast to some previous findings, see Kane et al., 2017; McVay et al., 2009). Because mind wandering requires decoupling attention from the current situation and shifting focus to internally-directed thought (Schooler et al., 2011), such a social effect may be expected as social interaction requires externally-focused attention (however, it's also possible that the oversampling of musicians and artists in the present sample could explain this effect). Because

social context may impact mind wandering, we encourage future studies to further examine social factors related to mind wandering in a variety of contexts (cf. Mildner & Tamir, 2021).

Limitations and Future Directions

The present study has some limitations to note. Regarding mind wandering's relationship with creativity, we did not account for mind wandering type (Agnoli et al., 2018; Zedelius et al., 2021) or individual-differences constructs related to mind wandering frequency (e.g., personality; Kane et al., 2017). Future studies should investigate whether certain types of mind wandering relate to different forms of creativity when accounting for relevant individual differences. Additionally, we opted for the most widely used mind wandering probe in the literature (i.e., a yes/no indication of TUT) to allow for better comparison with previous studies. However, mind wandering frequency can vary based on the type of probe used and the definition of mind wandering (e.g., how off-task is the task-unrelated thought, or TUT versus stimulus-independent thought; Gross et al., 2021; Kane et al., 2021; Seli et al., 2018). Although we found no evidence that creativity was related to the amount of TUT in daily life, it remains possible that other types of everyday mind wandering (e.g., stimulus-independent thought) may relate to creativity.

Regarding how daily life experiences relate to creativity, as the present study investigated domain-general measures of creative thinking and behavior, future studies are needed to explore effects of domain-specificity (cf. Gable et al., 2019). Furthermore, although the present study measured a wide range of emotions, they were not comprehensive enough to include all possible combinations of affective dimensions. Thus, future studies should measure carefully selected emotions to further isolate effects of activation and orientation related to creativity (cf. Gasper & Middlewood, 2014).

The present study is also limited in scope because we did not account for individual differences in other constructs that might contribute to the observed relationships between creativity and daily life experiences. For example, it's possible that our findings could be driven in part by underlying differences in openness to experience, a personality trait which has been closely linked to creativity, affect, and some forms of everyday mind wandering (Ivcevic & Brackett, 2015; Kane et al., 2017; Silvia et al., 2009). Thus, it remains unclear whether creative cognition and behavior predict daily life experiences when controlling for related individual differences such as openness to experience. Additional research is still needed to explain why creative thinking and behavior relate to everyday experiences. Indeed, we also encourage future work to address possible effects of specific facets of openness (e.g., aesthetic appreciation, openness to emotions, intellectual curiosity; Christensen et al., 2019) when studying the link between creativity and common experiences in daily life. Altogether, such work would allow for richer understanding of how and why creativity relates to everyday cognitive and affective experiences.

Conclusions

The present study investigated how different operationalizations of domain-general creativity (i.e., divergent thinking ability, creative behavior/achievement, and momentary creative project thought) relate to mind wandering, affective state, and thought content in daily life. We found that positive, activating emotions (i.e., happy and energetic) were positively linked to divergent thinking ability and momentary creative project thought, whereas no such associations were observed for creative behavior. Furthermore, we found that positive, deactivating emotions (i.e.,

relaxed and connected) negatively predicted in-the-moment creative project thought—evidence that the creativity-affect relation extends beyond valence and depends on other affective dimensions such as activation level. Overall, we found that creativity was generally associated with positively-valenced cognitive and affective experiences, such as having pleasant thoughts, engaging in enjoyable activities, and feeling motivated and inspired (positive and activating engagement-related emotions). No associations were found between everyday mind wandering frequency and creative cognition and behavior, suggesting that the overall amount of task-unrelated thought in daily life does not relate to individual creativity (measured in the lab). Future studies should further investigate factors involved in the relationships between creativity and daily life experiences to better understand the nature and effects of such relationships. Altogether, the present findings clarify the everyday experiential correlates of creative thinking and behavior by identifying the types of naturally occurring thoughts and emotions that characterize the creative mind in daily life.

Footnotes

[1] Owing to model convergence issues related to multicollinearity of similar items, we ran two negative emotion models: one without "frustrated" and the other without "irritable." We refer only to singular negative emotion model as there were no significant differences for "frustrated" or "irritated" and no major changes in results between the two models. Likewise, the behavioral activities variables were run in two separate models: one which excludes "enjoyable activity" and the other which excludes "wanted activity."

[2] Note that some of the "engagement-related emotions" in the present study may also be considered motivational or experiential states. Similarly, tiredness can be considered both a physical state and an affective state. Although we acknowledge such perspectives, we chose to conceptualize the engagement-related states and tiredness as emotions in the present study for the sake of clarity, because these states can all be experienced as feelings (see Tables 1 and 2).

[3] The familywise error rate is more appropriately defined based on the number of different tests of the same null hypothesis (within a study) rather than the total number of statistical tests within a study (Matsunaga, 2007; Rubin, 2017). Thus, despite the number of statistical tests in the present study, we maintain the standard $p < .05$ threshold for determining statistical significance, as these are primarily single tests of different null hypotheses. Such approaches are common in exploratory research which often involves testing a variety of hypotheses within a single study.

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