AMERICAN PSYCHOLOGICAL ASSOCIATION

Psychological Bulletin

ISSN: 0033-2909

2024, Vol. 150, No. 5, 621–641
https://doi.org/10.1037/bul0000428

On the Relationship Between Unprompted Thought and Affective Well-Being: A Systematic Review and Meta-Analysis

Julia W. Y. Kam[1, 2], Aaron Y. Wong[3], Raela F. Thiemann[1], Fiza Hasan[1], Jessica R. Andrews-Hanna[4], and Caitlin Mills[3]

[1] Department of Psychology, University of Calgary
[2] Hotchkiss Brain Institute, University of Calgary
[3] Department of Educational Psychology, University of Minnesota, Minneapolis
[4] Department of Psychology, University of Arizona

There is a growing recognition that thoughts often arise independently of external demands. These thoughts can span from reminiscing your last vacation to contemplating career goals to fantasizing about meeting your favorite musician. Often referred to as mind wandering, such frequently occurring unprompted thoughts have widespread impact on our daily functions, with the dominant narrative converging on a negative relationship between unprompted thought and affective well-being. In this systematic review of 76 studies, we implemented a meta-analysis and qualitative review to elucidate if and when unprompted thought is indeed negatively associated with affective well-being in adults. Using a multilevel mixed-model approach on 386 effect sizes from 23,168 participants across 64 studies, our meta-analyses indicated an overall relationship between unprompted thought and worse affective well-being ($\bar{r} = -.18$, 95% CI [−.23, −.14]); however, the magnitude and direction of this relationship changed when considering specific aspects of the phenomenon (including thought content and intentionality) and methodological approaches (including questionnaires vs. experience sampling). The qualitative review further contextualizes this relationship by revealing the nuances of how and when unprompted thought is associated with affective well-being. Taken together, our meta-analysis and qualitative review indicate that the commonly reported relationship between unprompted thought and affective well-being is contingent upon the content and conceptualization of unprompted thought, as well as the methodological and analytic approaches implemented. Based on these findings, we propose emerging directions for future empirical and theoretical work that highlight the importance of accounting for when, how, and for whom unprompted thought is associated with affective well-being.

Public Significance Statement

A large portion of our mental content is "unprompted" by nature such that it is unrelated to the ongoing task or our physical surroundings. Our meta-analytic review provides a comprehensive overview of how unprompted thought relates to how we feel, revealing that unprompted thoughts are generally associated with reduced affective well-being. Notably, this relationship was mitigated and at times reversed depending on the content of unprompted thought as well as how it was defined and measured. We found that unprompted thoughts were associated with worse affective well-being only when thoughts were unintentional, ruminative, and contain negative content. In fact, this relationship was not reliable when time-sensitive measures were used, and it even turned positive during future-oriented, positive, or freely moving thoughts. Taken together, we found that the type and content of unprompted thought can determine whether it is linked to our happiness.

Keywords: mind wandering, spontaneous thought, task-unrelated thought, affective well-being, meta-analysis

Supplemental materials: https://doi.org/10.1037/bul0000428.supp

This article was published Online First April 15, 2024.

Julia W. Y. Kam https://orcid.org/0000-0002-2369-2148

Fiza Hasan is now at the Department of Psychology, Simon Fraser University, Vancouver.

The authors thank Caity Cegavske for her assistance in creating Figure 3 as well as Bhavneet Chohan for her assistance in coordinating references. Data for this project are archived at https://osf.io/yrhmg/.

Julia W. Y. Kam played a lead role in conceptualization, methodology, project administration, resources, supervision, writing–original draft, and writing–review and editing, a supporting role in formal analysis, and an equal role in visualization. Aaron Y. Wong played a lead role in formal analysis and a supporting role in visualization, writing–original draft, and writing–review and editing. Raela F. Thiemann played a supporting role in conceptualization and writing–review and editing and an equal role in methodology. Fiza Hasan played a supporting role in conceptualization and writing–review and editing and an equal role in methodology.

continued

An inevitable feature of our conscious experience is that our minds often shift away from external demands to our inner milieu. Often referred to as mind wandering, this phenomenon involves unprompted thoughts that are unrelated to the ongoing task or the external environment at large. Not only are these thoughts highly prevalent in our everyday life (Kane et al., 2007), but they have also been linked to wide ranging impacts on our daily functioning. Although beneficial effects include enhanced creativity in both laboratory (Baird et al., 2012) and real-world settings (Zedelius & Schooler, 2015), it is often associated with negative outcomes on task performance (Randall et al., 2014) and sleep quality (Carciofo et al., 2014). Perhaps the most notable association concerns affective well-being. The measures used in these studies tend to range anywhere from transient mood or affective states (Choi et al., 2017; Crosswell et al., 2020; Linz et al., 2021; Ottaviani et al., 2015; Poerio et al., 2015) to more comprehensive measures including life satisfaction (Abu-Rayya et al., 2019; Tudino et al., 2020) and symptoms of psychiatric disorders (Crosswell et al., 2020; Hoffmann et al., 2016; Marchetti et al., 2014).

Despite accumulating evidence in the literature suggesting that unprompted thoughts may be negatively associated with affective well-being, several other findings offer caveats about factors such as the content, dynamics, and timing of these thoughts that modulate the direction and magnitude of this relationship (Franklin et al., 2013; Mills, Porter, et al., 2021; Poerio et al., 2013; Ruby et al., 2013; Thiemann et al., 2023). Notably, the general negative reputation persists. Our goal is thus to offer a quantitative and qualitative summary that accounts for this body of work and all its variable findings. In what follows, we report a systematic review along with a meta-analysis and qualitative summary of the relationship between unprompted thought and affective well-being. We then discuss open questions and propose emerging directions for future research in order to achieve a comprehensive understanding about when, how, and for whom this relationship emerges.

Conceptualizations of Unprompted Thought and Affective Well-Being

Unprompted thought and affective well-being are both constructs that encompass a panoply of states and processes. Our description aims to characterize these constructs by how they are most commonly defined in the literature, with less emphasis on aligning them to a specific theoretical framework. Here, we use the term unprompted thought to refer to thoughts that spontaneously arise, are internally generated, and are not driven by ongoing tasks or external stimuli in our immediate environment (see Smallwood, 2013, for a framework that explains this phenomenon). In our review, we place no restrictions on how these thoughts are initiated or how they unfold over time. Unprompted thoughts can occur unintentionally with no overarching aim, or they can arise intentionally when someone chooses to disengage from their task (Seli et al., 2016). These thoughts can also freely shift from one topic to another, or they may be focused on one topic in a goal-directed manner on the one hand or a ruminative manner on the other (Christoff et al., 2016). In the context of a task, unprompted thoughts are unrelated to the ongoing task (Smallwood & Schooler, 2006). Although the reviewed literature has mainly characterized mind wandering as task-unrelated thought (Mills et al., 2018), there is an ongoing debate on how mind wandering should be precisely defined in the field (Christoff et al., 2016, 2018; Seli et al., 2018). Therefore, we broadly use the term "unprompted thought" to refer to this phenomenon encompassing various definitions in the discussion of our findings. When reporting our analyses, we use the specific characterization of unprompted thought, such as task-unrelated thought, to refer to the examined phenomenon in the reviewed studies.

Affective well-being is a similarly comprehensive term that is broadly defined by both momentary and prolonged states. Although existing frameworks draw clear distinctions between similar terminologies (Russell, 2003), our review will consider both transient states as well as relatively stable measures under the umbrella term of affective well-being. Assessed at momentary time points or across certain time intervals, this includes mood or affective valence (as quantified by the frequency and/or intensity of positive and negative affect); when assessed mainly across longer time intervals, this includes general life satisfaction and symptomatology associated with anxiety or depression. Taken together, these are all widely used measures in the affective science literature and are thus all included in the reviewed reports. As with measures of unprompted thought, we delineated the aspect of affective well-being assessed in each study to provide granularity in our analysis.

Background and State of the Literature

A seminal study titled "A Wandering Mind Is an Unhappy Mind" originally reported a relatively strong, negative, and causal relationship between task-unrelated thought and mood (Killingsworth & Gilbert, 2010). This study revealed two important findings: (a) being off-task is associated with significantly more negative concurrent mood than being on-task and (b) being off-task at one time point predicted more negative affect at a subsequent time point, with a minimum lag time of multiple hours. Since its publication, the negative reputation of mind wandering has become somewhat of a consensus, yet it is worth noting that task-unrelated thought itself does not appear to be associated with being in a negative mood state (Fox et al., 2018). In fact, even in the Killingsworth and Gilbert (2010) study, task-unrelated thought was, on average, associated with a relatively neutral state—falling slightly on the positive side of the midpoint of the subjective affective valence scale. That said, task-unrelated thought is indeed consistently found to be more negative than being on-task (Fox et al., 2018; Killingsworth & Gilbert, 2010; Mills, Porter, et al., 2021).

In the decade since this study was published (Killingsworth & Gilbert, 2010), numerous studies have revealed more nuanced relationships between forms of unprompted thought and affective well-being. It is generally thought to depend on a few factors.

Jessica R. Andrews-Hanna played an equal role in conceptualization, visualization, and writing–review and editing. Caitlin Mills played a supporting role in supervision and an equal role in conceptualization, visualization, and writing–review and editing.

Correspondence concerning this article should be addressed to Julia W. Y. Kam, Department of Psychology, University of Calgary, 2500 University Drive NW, Calgary, AB T2N 1N4, Canada. Email: julia.kam@ucalgary.ca

First, the content regulation hypothesis (Andrews-Hanna et al., 2014; Smallwood & Andrews-Hanna, 2013) purports that the phenomenological content of task-unrelated thought is more directly linked to the functional outcomes of those thoughts. In other words, task-unrelated thought in and of itself does not necessarily lead to positive or negative consequences; instead, where the mind drifts off to is the determinant. Empirical evidence supporting this hypothesis has indicated that the valence (Poerio et al., 2013), the temporal focus (Engert et al., 2014; Ruby et al., 2013), and the self-perceived interestingness of our task-unrelated thought (Franklin et al., 2013) are differentially related to affective states across the spectrum. Second, several frameworks have purported that the way in which thoughts unfold may offer additional explanatory power in how we feel. One such characterization concerns whether task-unrelated thought is initiated with or without intention; this distinction has led to dissociable outcomes in affective states and symptoms of attention-deficit/hyperactivity disorder (ADHD; Seli et al., 2016). Another framework suggests that how thoughts unfold dynamically (Christoff et al., 2016) may also offer explanatory power in affective well-being; dimensions stemming from this framework, such as "freely moving thought," have been associated with positive affective states independent of its task-relatedness (Mills, Porter, et al., 2021; Thiemann et al., 2023). The varying nature of unprompted thought has therefore been associated with different transient affective states as well as more stable characteristics such as symptoms of psychiatric disorders.

Another important factor that may account for variable results is the methodological approach implemented in these studies. The two most common approaches to studying the association between unprompted thought and affective well-being—questionnaires and experience sampling—may capture different aspects of the relationship. Questionnaires provide a retrospective summary of one's experience usually across a comparatively longer term time interval (such as 1 week). In contrast, experience sampling involves sampling one's momentary experience, thereby providing the temporal precision necessary to reveal how transient thoughts and affective states are related to each other in the moment (Shiffman et al., 2008). The experience sampling approach is usually implemented during an experimental task in a laboratory setting or throughout the course of a day in participants' daily lives—the latter is also referred to as ecological momentary assessment (Shiffman et al., 2008). Given the distinct nature of these two methodological approaches, they may inform different aspects of the relationship between unprompted thought and affective well-being.

Considering these caveats, the scientific study of unprompted thought is left with the lingering question: What is the precise nature of the relationship between unprompted thought and affective well-being? Here, we address this question through a systematic review and meta-analysis by integrating studies that use different methods, conceptualizations, and measures of unprompted thought. We offer four main contributions: (a) a descriptive meta-analysis using a multilevel, mixed-model approach detailing the direction and magnitude of the overall relationship between unprompted thought and affective well-being based on the Pearson's product–moment correlation effect size metric; (b) meta-analytic comparisons for how this relationship is moderated by varying thought content and methods; (c) a qualitative summary of the effects that could not be captured through meta-analytic methods due to small samples; and (d) a discussion about open questions and a novel framework for guiding future work on this topic.

Method

Search Strategy

We conducted a comprehensive literature search using the following electronic databases: APA PsycInfo (OVID), EMBASE (OVID), Medline (PubMed) as well as Scopus (Academic Search Complete) between June 26th and 29th, 2021, and on March 29, 2023. Only empirical reports written in English were considered, and no restrictions were applied on publication dates nor publication formats (i.e., "gray" literature involving materials published outside of traditional publication channels such as dissertations were included). Our search terms were based on the two core concepts in our review, unprompted thought and affective well-being, and were restricted to the Title, Keywords, and Abstract sections in our search. Search syntax and strategies were tailored to each search engine to ensure all search terms, and their variations were considered. We reviewed the reference section of included articles to ensure all relevant articles were identified during the screening stage. An example of search strings used for one of the aforementioned databases is reported in the Supplemental Material.

The search terms for unprompted thought included "mind wandering," "daydreaming," "task-unrelated thought," "stimulus-independent thought," "self-generated thought," "off-task thought," "spontaneous thought," "freely moving thought," and "internal attention." We also included alternative spellings of these terms in the search (e.g., "mind-wandering," "task unrelated thought"). As mentioned in the Introduction section, we considered unprompted thought as an umbrella term that encapsulates various types of thoughts that are generated by oneself, which can include thoughts unrelated to the ongoing task or external environment as well as thoughts that freely move from one topic to another.

These terms were searched in conjunction with terms related to affective well-being, which included "positive affect or emotion or mood" (with each of these three terms used in three independent searches combined with the above unprompted thought terms), "negative affect or emotion or mood," "sadness," "happiness," "well-being," "distress," and "emotional state." We considered affective well-being as an umbrella term that encompasses three core components. One component is affect, which includes both momentary as well as more stable measures of positive and negative affect. A second component involves psychiatric symptoms, which are characterized by measures such as depression or anxiety. Finally, the third component captures overall well-being or quality of life, which is exemplified by measures such as life satisfaction. Across these three components of affective well-being, we also considered potential differences in the positive versus negative aspects of the different components. Specifically, past work has shown that the presence of positive aspects does not imply the absence of negative aspects (Headey et al., 1984; Ryff et al., 2006); therefore, these results applied to affective well-being would suggest that improving affective well-being can be independently indexed by either an increase in positive affect or life satisfaction, or a decrease in negative affect or depression. Our initial search yielded a total of 2,068 reports. Of those, 1,174 were removed after being identified as duplicates, leaving 894 unique reports.

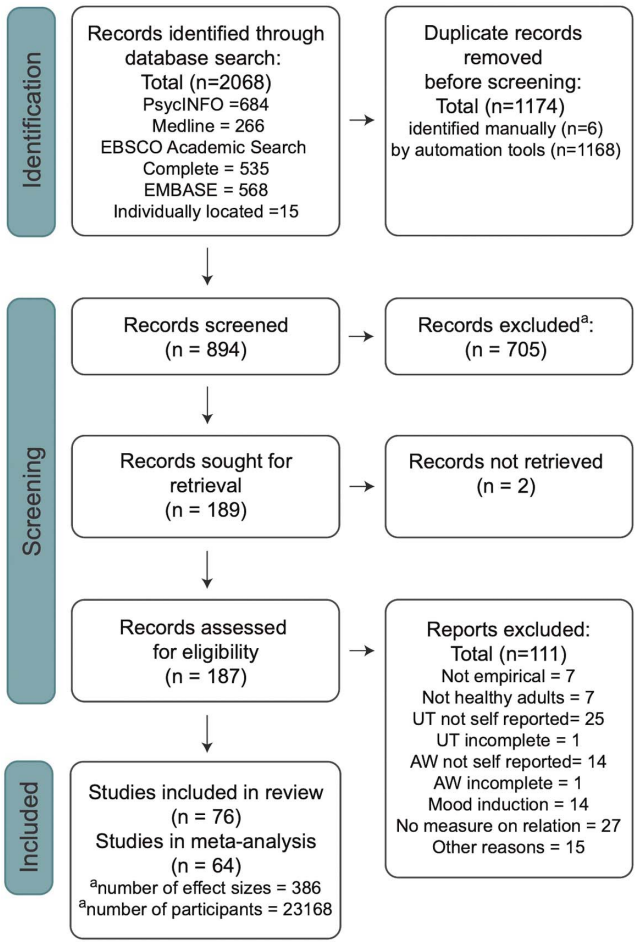
Selection Criteria

The following inclusion criteria were implemented: empirical studies involving (a) adults (over 18 years old) with or without a diagnosis of mood or anxiety disorders (which may be confirmed via clinical interviews); (b) using retrospective, online, or questionnaire-based self-report measures of unprompted thought during a lab-based task or in daily life; (c) a self-report measure of affective well-being; (d) quantified measures or validated questionnaires of unprompted thought and affective well-being; and (e) an assessment of the relationship between unprompted thought and affective well-being using quantitative methods and statistical analysis. Consistent with past reviews involving unprompted thought (Fox et al., 2018; Kam et al., 2022), we only considered studies that used self-report measures of unprompted thought and affective well-being as they provide a direct assessment of one's thought type and affective well-being. This includes questionnaires, which require individuals to retrospectively report their propensity for unprompted thought or overall affective well-being within a certain time frame in everyday life; experience sampling measures, in which one reports when they catch themselves having unprompted thought (i.e., self-caught) in the moment or reports their current attentional and/or affective state as occasionally prompted by the experimenter (i.e., probe-caught); and posttask questions, which involves a retrospective report of one's overall attentional or affective state during a task upon task completion. Finally, studies involving clinical populations were included only if the outcome measure of interest (i.e., relationship between unprompted thought and affective well-being) was independently reported for participants who fit the inclusion criteria.

If the inclusion criteria were met, the following exclusion criteria were also implemented: (a) studies involving healthy participants under 18 years of age, or involving populations with known substance abuse, neurological conditions, or a psychiatric diagnosis other than mood disorders; (b) studies in which the unprompted thought and affective well-being measures were based on reverse inferences (e.g., behavioral or physiological measures); (c) studies involving mood induction; (d) studies involving reanalyses of previously published data if the same outcome measures of interest were reported; and (e) reviews, meta-analyses, opinion pieces, case studies, or studies that did not use quantitative analyses. We implemented a two-stage screening process. At Stage 1, two authors (F. H. and R. T.) independently screened the titles, abstracts, and keywords according to the above selection criteria in Covidence, an online platform designed to manage systematic reviews. In cases of conflict between the two authors with respect to inclusion versus exclusion, a third author (J. K.) made a final decision upon discussion with the other two authors. At Stage 2, F. H. and R. T. screened full-text reports that were considered eligible from Stage 1. The interrater reliability rates for the initial screening and full screening stages in terms of agreement were 90% and 90% (and in terms of Cohen's κ: 0.73 and 0.80), respectively. Initial and full-text screening was implemented on the remaining 894 reports, of which 818 were excluded resulting in a total of 76 reports. No additional reports were identified through reviewing references of eligible reports and recent reviews. Figure 1 presents the screening and selection procedures based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.

Figure 1

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flow Diagram



Note. "No measures on relation" refers to studies that did not report a relationship between unprompted thought and affective well-being. "unprompted thought incomplete" and "affective well-being incomplete" refer to studies that did not include quantified or validated self-report measures of unprompted thought or affective well-being, respectively. "UT" = unprompted thought; AW = affective well-being; EBSCO = Elton B. Stephens Company; EMBASE = Excerpta Medica Database. See the online article for the color version of this figure.

[a] Records excluded = studies were excluded at the initial screening stage because they did not meet inclusion criteria or met exclusion criteria (as detailed in the Methods section).

Data Extraction

For each report, the following information was extracted: (a) study information (authors, title, location, publication year); (b) sample characteristics (age range, gender/sex, healthy/clinical group membership, eligibility criteria) and sample size; (c) experimental conditions; (d) unprompted thought: definition, measurement type, and measurement method (e.g., range of response scale or questionnaire scores, mean value of participants' response on the measures); (e) affective well-being: aspect of measure (e.g., positive affect, depression), type

of measure (questionnaire, experience sampling, posttask questions), and details of measure (range of response scale or questionnaire scores, mean value of participants' response on the measures); and (f) the relationship between unprompted thought and affective well-being (i.e., the presence and direction of relationship, statistical values associated with the relationship, effect size). We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study.

Specifically for the meta-analysis, unprompted thought was coded for specificity (general or specific, e.g., unprompted thought irrespective of content vs. specific content such as rumination) and valence (positive or negative, e.g., thoughts about a relaxing vacation vs. a failure). The type of affective well-being was coded as positive or negative. In addition, negative aspects of affective well-being were further distinguished by type that were coded as depression or anxiety. The methodological approach was coded as questionnaire, experience sampling, or posttask questions. Questionnaire-based studies were further coded as affective-based measures (e.g., positive and negative affect), and nonaffective based measures, including psychiatric symptoms (e.g., depression and anxiety) or quality of life (e.g., life satisfaction).

For studies that did not report information necessary for the meta-analysis, we contacted authors of primary studies twice to obtain the relevant data. If we were not able to obtain up-to-date contact information for the first author, we reached out to the last author. The response rate was 50%. Among the 76 reports published between 1962 and 2023 that fulfilled the selection criteria, a final set of 64 reports contained sufficient information to be included in the meta-analysis. The remaining 12 reports included in the systematic review but not in the meta-analysis are listed in Supplemental Table 2.

For the assessment of methodological quality of included studies, we adapted questions from two existing quality assessment tools: Standard Quality Assessment Criteria for Evaluating Primary Research Papers (Kmet et al., 2004) and the Quality Assessment of Diagnostic Accuracy Studies (Whiting et al., 2011). Accordingly, the methodological rigor of the experimental design and data analysis were evaluated in the following areas: selection bias, study design, validity of measures, and completeness of reported information. Each criterion was assigned a quality score of 0–2 (i.e., 0 = weak/no, 1 = moderate/partial, and 2 = strong/yes) as they pertain to each criterion. In addition to being assigned a score for each criterion, the scores for all criteria were then averaged to create a global score assigned to each study. All included studies had moderate-to-strong scores. The details and results of this assessment are reported in Supplemental Materials.

Meta-Analysis Procedure

To account for the various experimental designs and methods of measurements of unprompted thought and affective well-being across studies, analyses were done using samples instead of studies (Borenstein et al., 2021). Each sample in the meta-analysis represents an independent group of participants removing the between- and within-subjects design distinction, and each measurement is a unique correlation between a measure of unprompted thought and a measure of affective well-being. Nonetheless, multiple measurement types (i.e., different measures used to index affective well-being) could be obtained from the same sample which is addressed in the analysis descriptions. From the 64 studies included in the meta-analysis, 78 samples were obtained with 386 measurements (M = 4.95; Mdn = 3.00; SD = 4.94; range = 1–24 measurements per sample).

To be included in the meta-analysis, studies were required to report a Pearson's product–moment correlation or statistical values that could be used to approximate a Pearson's correlation. Nine studies had standardized betas that were estimated using the procedures outlined by Peterson and Brown (2005). Five studies had unstandardized betas that were estimated using the "esc" package in R. Given the inclusion of multiple Pearson's correlation coefficients from the same sample in a "standard" meta-analysis would artificially reduce heterogeneity increasing likelihood of Type I errors; multilevel meta-analyses were performed to account for dependency amongst effect sizes (Van den Noortgate et al., 2013).

The meta-analysis was conducted using the *metafor* package in R (Harrer et al., 2019; Viechtbauer, 2010). First, to examine the overall relationship between unprompted thought and affect, a three-level, mixed-effects model was performed with correlation measurement (Level 2) nested under sample (Level 3). This analysis allows us to account for between-study variance (Level 3) and within-study variance (Level 2) and included all possible samples. We then tested the effects of "moderators" to see if this relationship changed as a result of other variables (e.g., measurement type, content type). These were implemented via "pairwise comparisons," which involved filtering the samples into appropriate subgroups (e.g., questionnaire or experience sampling when examining unprompted thought measurement type), then using the mixed-effects model structure with the moderator as a moderating variable. Specifically, these subgroup level analyses only included samples that reported values relevant for the moderator in question. For a given sample, if no information about a moderator (e.g., no valence for unprompted thought) was reported or a combination of the moderator categories (e.g., both questionnaires and experience sampling) was used but not reported individually for each category, the sample was excluded from the respective subgroup analysis. If studies reported separate correlations involving overall and specific types of unprompted thought for a sample, then correlations based on overall unprompted thought were used; otherwise, correlations based on specific unprompted thought were used.

As the meta-analysis was conducted on correlation values, the β coefficient calculated in the overall model was reported as such. For comparisons between slopes (characterizing the relationship between unprompted thought and affective well-being) of the subgroups in the specific analysis, β coefficients were computed for each subgroup which corresponds to the pooled correlations reported in the Results section. τ^2 was estimated using restricted maximum likelihood. The Q and I^2 statistics were also used to assess heterogeneity between studies.

Qualitative Review Procedure

In addition to the meta-analysis, we provided a qualitative account of additional results that complements the meta-analysis findings. As an extension of the meta-analysis, the themes extrapolated from all included studies focused on other potential moderators (specifically other content of unprompted thought and analytic approaches) that may influence the relationship between unprompted thought and affective well-being. These themes primarily emerged from subsets of data that had insufficient

number of samples to be included in the meta-analysis, which were recurring across studies or represented important directions for future studies. Similar to synthesis approaches in other unprompted thought reviews (Kam et al., 2022; Lanier et al., 2021), given the small number of studies available for each theme, we summarized their results within each theme and indicated the number of studies that reported a particular finding. If the majority (>50%) of studies converged on a particular pattern of results, we consider this as convergent evidence to support those results and draw preliminary conclusions accordingly. We acknowledge, however, that, because studies in our qualitative review were limited in number, the themes we summarized should be considered tentative until research in these areas can support a quantitative meta-analysis.

Publication Bias

It is important to consider the possibility of publication bias in the meta-analytic results. To assess the possibility of publication bias in studies examining the relationship between unprompted thought and affective well-being, two methods were used. First, a funnel plot was created showing standard error on the *Y*-axis and Pearson correlation coefficients on the *X*-axis, summarizing the relationship between unprompted thought and affective well-being across samples. When publication bias is present, the funnel plot will appear asymmetrical. Second, asymmetry of the funnel plot was assessed by extending Egger's regression test (Egger et al., 1997) to the multivariate model as recommended by Rodgers and Pustejovsky (2021). This assessment was done by adding in the inverse samples sizes as a predictor in the main analysis (i.e., examining the overall relationship between unprompted thought and affective well-being).

Transparency and Openness

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines for systematic reviews (Moher et al., 2010). The review protocol was created using the International Prospective Register of Systematic Reviews template and preregistered on the Open Science Framework at https://osf.io/yrhmg/. Following are deviations from this protocol: (a) The core concepts have been renamed (from mind wandering to unprompted thought, and from well-being to affective well-being) and (b) "daydreaming" was added to the search terms for unprompted thought. Data were analyzed using R, Version 4.2.2 (R Core Team, 2022), RStudio (Version 2022.07.2+576), and several packages for the corresponding analyses as reported above. The meta-analytic data and analysis code are publicly available at https://osf.io/yrhmg/.

Results

Overview

The final set of 64 studies included in the meta-analysis sampled a total of 23,168 participants. Most were healthy participants who were not assessed for clinical diagnoses and recruited via convenience sampling. Notably, four studies consisted of clinical populations with a formal diagnosis, including individuals with social anxiety disorder (Arch et al., 2021), major depressive disorder (Giambra et al., 1994; Hoffmann et al., 2016; Rostami et al., 2022), and bipolar disorder (Rostami et al., 2022); and six studies included subclinical population experiencing maladaptive daydreaming (Abu-Rayya et al., 2019, 2020; Musetti et al., 2021), depressive symptoms (Crosswell et al., 2020; Guesdon et al., 2020), and chronic stress (Murphy et al., 2013). Supplemental Table 3 presents the characteristics of samples, information about where and when studies were published, descriptive statistics and measures of relevant variables as well as presence of moderators in all 76 included reports. These reports were published between 1962 and 2023, with most reports ($n = 69$) published after 2000. Furthermore, the majority of the reports ($n = 61$) were conducted in Western countries, with the remaining 15 reports conducted in countries in Asia and the Middle East. Table 1 summarizes the number of studies that adopted each methodological approach in the meta-analysis.

Given that the content and type of unprompted thought and the implemented methodological approaches appear to account for variation in the relationship between unprompted thought and affective well-being, we highlight these characteristics in our quantitative and qualitative summary and discussion of the studies.

Quantitative Summary: Meta-Analysis

The overall analysis included 78 samples with 386 measurements across the 64 reports. Analyses with moderators examined methodological approaches, the content of unprompted thought, and type of affective measures. Specifically, the analysis comparing methodological approaches included 78 samples, of which 43 used questionnaires, 14 used experience sampling, and four used posttask questions with 189, 45, and seven measurements, respectively. A secondary analysis comparing questionnaire-based studies included 15 samples that used

Table 1
Distribution of Samples, Measurements, and Participants Across Studies Included in the Meta-Analysis

Type of approach and measure	Sample	Measurement	Participant
Overall	78	386	23,168
Methodology			
Questionnaires	43	189	19,675
Experience sampling	14	45	1,344
Posttask questions	4	7	712
Questionnaire type			
Affective scales	35	144	17,707
Nonaffective measures	15	43	3,406
Thought valence			
Positive	7	24	878
Negative	23	77	8,893
Thought intentionality			
Intentional	8	36	5,724
Unintentional	8	36	5,724
Affective well-being			
Positive	41	99	8,186
Negative	63	223	20,005
Negative affective measures			
Depression	29	69	8,938
Anxiety	16	42	7,686

Note. The sum of the reported number of samples per measure exceeds the total number of included samples ($N = 78$) because some reports implemented more than one methodological approach. For methodology, only samples that used only one methodology were counted.

affective scales (e.g., positive and negative affect) and 35 that used nonaffective measures (including psychiatric symptoms and quality of life); each had 45 and 144 measurements, respectively. In terms of the valence of thought content, seven samples examined positive unprompted thoughts and 23 examined negative unprompted thoughts with 24 and 77 measurements, respectively. Moreover, the analysis examining the intentionality of unprompted thought involved eight samples that examined intentional unprompted thoughts and eight that examined unintentional unprompted thoughts—both had a total of 36 measurements. In terms of positive and negative aspects of affective well-being measures, 41 samples examined positive and 63 examined negative aspects with 99 and 223 measurements, respectively. An additional analysis examining negative aspects involved 29 samples that measured depression and 16 that measured anxiety, with 69 and 42 measurements, respectively. Both of these analyses involving positive and/or negative aspects included affective well-being measures regardless of methodology.

Among the studies included in the meta-analysis, there appears to be some overlap across the above-mentioned moderators. For example, certain measures of negative affective states (such as depression and anxiety) were almost exclusively measured via questionnaires. Studies were also more likely to assess thought valence via questionnaires versus experience sampling. Similarly, the intentionality of unprompted thought was mainly assessed via questionnaires (75%) as opposed to experience sampling (25%). Most of the other moderators did not seem to be assessed using one particular methodological approach over another. Moreover, there does not appear to be a time period when studies favored one particular approach over another. As an example, the range in time in which studies employed the questionnaire approach (1978–2023) is similar to the experience sampling approach (1986–2022), as is the proportion of studies that employed either approach prior to 2000 (16% questionnaires vs. 14% experience sampling).

Table 2 presents the meta-analysis results summarizing the relationship between unprompted thought and affective well-being for overall and subgroup measurements. Supplemental Table 4 reports the correlations for each measurement as well as characteristics of all samples included in the meta-analysis. Figure 2 shows a radial Galbraith plot of effect sizes as indexed by standardized estimates plotted against the inverse of their corresponding standard errors for all measurements, displaying the heterogeneity across effect sizes (Galbraith, 1988). Tests of homogeneity showed that the samples came from a heterogeneous distribution, $\tau^2 = .02$, $I^2 = 93.22$, $Q = 3475.32$, $p < .001$.

Overall Relationship Between Unprompted Thought and Affective Well-Being

We first tested the overall relationship between unprompted thought and affective well-being collapsing across all studies. Overall, increased rates of unprompted thought were associated with more negative affective well-being, $\bar{r} = -.18$, $SE = 0.02$, $p < .001$, 95% CI [−.23, −.14]. Squaring the averaged effect size ($\bar{r} = -.18$) suggests that unprompted thought explains around 3% of the variance in affective well-being.

The Influence of Methodological Approaches of the Study

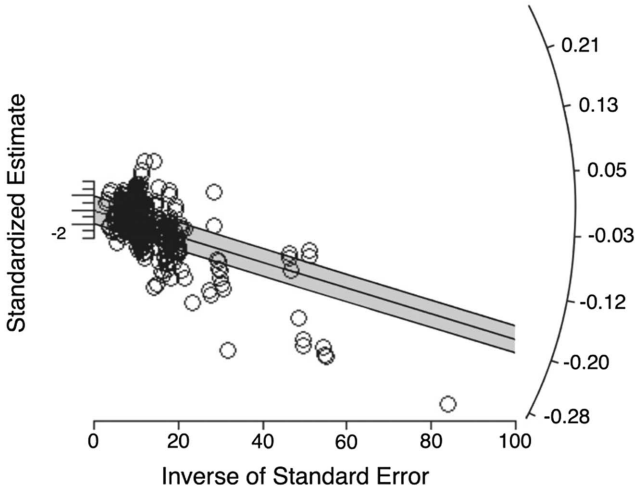
In this and subsequent sections, we assessed the effects of several variables that moderate the association between unprompted thought and affective well-being, first focusing on methodological approaches. First, for each methodological approach, the pooled correlation was $r = -.27$ ($p < .001$) for questionnaires, $r = -.04$

Table 2
Relationship Between Unprompted Thought and Affective Well-Being for Overall and Subgroup Measurements

Type of approach and measure	$\bar{r}$	*SE*	*t*	p_T	95% CI	*F*	p_F
Overall	−.18	0.02	−7.60	<.001	[−.23, −.14]		
Methodology						21.10	<.001
Questionnaires	−.27	0.02	−12.73	<.001	[−.31, −.23]		
Experience sampling	−.04	0.05	−0.81	.423	[−.13, .06]		
Posttask	−.05	0.08	−0.64	.547	[−.24, .14]		
Questionnaire type						5.27	.469
Affective scales	−.28	0.04	−7.77	<.001	[−.35, −.21]		
Nonaffective measures	−.26	0.02	−10.52	<.001	[−.31, −.21]		
Thought valence						73.94	<.001
Positive	.13	0.04	3.13	.005	[.04, .21]		
Negative	−.30	0.03	−10.86	<.001	[−.36, −.25]		
Thought intentionality						9.73	.003
Intentional	−.15	0.02	−5.93	<.001	[−.20, −.10]		
Unintentional	−.26	0.03	−7.40	<.001	[−.33, −.19]		
Affective well-being						22.01	<.001
Positive	−.09	0.03	−2.97	.004	[−.16, −.03]		
Negative	−.23	0.02	−9.98	<.001	[−.28, −.19]		
Negative affective measures						0.10	.749
Depression	−.22	0.03	−6.31	<.001	[−.28, −.15]		
Anxiety	−.20	0.04	−4.19	<.001	[−.30, −.10]		

Note. Overall analyses included all samples. $\bar{r}$ = β coefficients for overall analysis and pooled correlations for other analyses. *F* values reflect main effects of subgroups (e.g., comparing intentional and unintentional unprompted thoughts), and *t* values reflect whether each level of subgroup differs from zero (e.g., assessing whether the relationship between intentional unprompted thought and well-being is significantly different from 0). CI = confidence interval; *SE* = standard error.

Figure 2
Galbraith Plot of Effect Sizes



Note. Effect sizes are indexed by standardized estimates plotted against the inverse of their corresponding standard errors, revealing the heterogeneity of effect sizes across samples in our meta-analysis.

($p = .423$) for experience sampling, and $r = -.05$ ($p = .547$) for posttask questions. Second, in comparing methodological approaches, we found that questionnaires had a stronger, negative relationship between unprompted thought and affective well-being compared to experience sampling, $F(1, 232) = 23.28$, $p < .001$, and posttask questions, $F(1, 194) = 5.97$, $p = .016$. There was no significant difference between experience sampling and posttask questions, $F(1, 50) = 0.01$, $p = .925$.

A secondary analysis was performed to examine if the type of affective well-being index modulated the relationship for studies that used questionnaires only. The pooled correlation was $r = -.27$ ($p < .001$) for affective scales and $r = -.26$ ($p < .001$) for nonaffective measures (e.g., psychiatric symptoms and quality of life). No significant difference was observed in the relationship between unprompted thought and affective well-being between the two questionnaire types, $F(1, 187) = 0.56$, $p = .454$.

Content of Unprompted Thought

Thought Valence. The pooled correlation was $r = .13$ ($p < .001$) for positive and $r = -.30$ ($p < .001$) for negative thought valence. The relationship between unprompted thought and affective well-being was significantly more negative when unprompted thoughts were negative than positive, $F(1, 99) = 73.94$, $p < .001$.

Intentionality. The pooled correlation was $r = -.15$ ($p < .001$) for intentional and $r = -.26$ ($p < .001$) for unintentional unprompted thoughts. The relationship between unprompted thought and affective well-being was more negative when unprompted thoughts were unintentional than intentional, $F(1, 70) = 9.73$, $p = .003$.

Positive and Negative Aspects of Affective Well-Being

For this analysis, the affective measures were put on the same scale for ease of comparison such that the sign of the correlation was flipped for negative measures. In other words, more negative correlation values indicate unprompted thought was associated with worse affective well-being. The pooled correlation between unprompted thought and affective well-being was $r = -.09$ ($p = .004$) for positive measures and $r = -.23$ ($p < .001$) for negative measures. The relationship between unprompted thought and affective well-being was more negative when affective well-being was measured in terms of negative than positive measures, $F(1, 320) = 22.01$, $p < .001$.

A secondary analysis was performed to examine if the type of negative aspects of affective well-being modulated the relationship. The pooled correlation was $r = -.22$ ($p < .001$) for depression and $r = -.20$ ($p < .001$) for anxiety. No significant difference was observed in the relationship between unprompted thought and affective well-being between the two types of negative measures, $F(1, 111) = 0.10$, $p = .749$.

Publication Bias

Supplemental Figure 2 shows the funnel plot of Pearson correlation coefficients. A visual inspection suggests that publication bias may be present. Yet an assessment of asymmetry of the funnel plot by extending Egger's regression test to the main analysis (overall relationship between unprompted thought and affective well-being) indicates that there was no asymmetry, $F(1, 336) = 0.61$, $p = .436$.

Interim Summary of Meta-Analysis Results

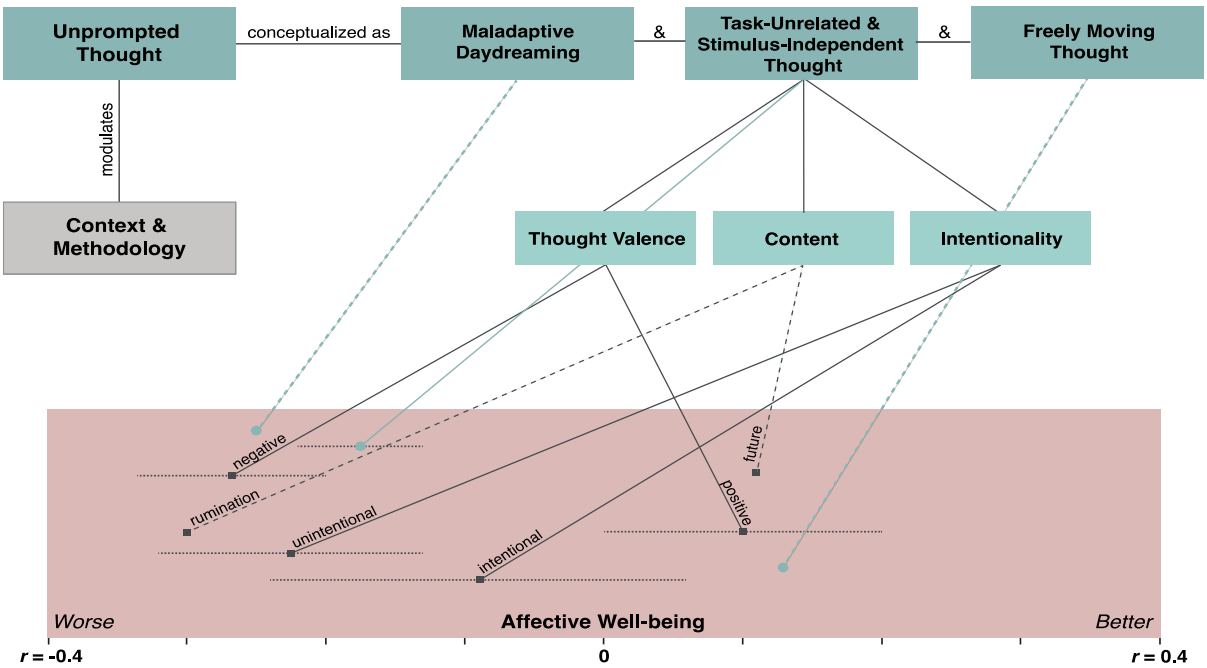
Our meta-analysis results highlighted several patterns, which are summarized in Figure 3. First, there is an overall negative relationship between unprompted thought and affective well-being when thought content and methodology were not considered. In subsequent analyses examining moderating variables, we found that this association between unprompted thought and affective well-being was (a) more negative when thoughts were negatively versus positively valenced, (b) more negative when thoughts were unintentional compared to intentional, (c) stronger when negative measures were used to index affective well-being relative to positive measures, and (d) only significant when assessed via questionnaires. Notably, positively valenced unprompted thought was positively associated with affective well-being. The specific measures of negative aspects of affective well-being (i.e., depression vs. anxiety) did not significantly modulate the direction or magnitude of the relationship between unprompted thought and affective well-being.

Qualitative Review

The meta-analytic results above give us some insight into factors that modulate the relationship between unprompted thought and affective well-being and how they statistically differ. Nonetheless, analyses were not implemented on certain subsets of data given the smaller number of samples for some comparisons of interest (e.g., temporal orientation of unprompted thought). We thus provide a qualitative account of additional findings, with a focus on summarizing how other content of unprompted thought and analytic approaches may influence the relationship between unprompted thought and affective well-being.

Figure 3

Summary of Findings From the Meta-Analysis and Qualitative Review Characterizing the Relationship Between Unprompted Thought and Affective Well-Being



Note. This figure illustrates the magnitude and direction of the relationship between unprompted thought and affective outcomes (bottom panel) as a function of several moderators, including the conceptualization of unprompted thought (top panel) and their thought valence, content, and intentionality (middle panel). In the bottom panel, values range from a negative relationship on the left indicating worse affective outcomes of unprompted thought to a positive relationship on the right indicating better affective outcomes. The location of the dots/squares in the bottom panel reflects the reported correlation-based effect sizes (along with the 95% confidence interval as represented by horizontal lines) in the meta-analysis or mean correlation values in the qualitative review (averaged across studies that examined the given moderator). Meta analyses results are represented by solid lines, and qualitative results are represented by coarse dotted lines, which connect to the moderators of interest in the top/middle panels. Teal colored dots and lines represent results based on the unprompted thought conceptualization moderators, and black colored squares and lines represent the results based on the thought valence, content, and intentionality moderators. As our qualitative review was based on a limited number of studies, the results presented here should be considered tentative until sufficient research can support a quantitative meta-analysis. See the online article for the color version of this figure.

Content of Unprompted Thought

Future-Oriented Thoughts. A commonly reported content of thought concerns mentally traveling to the future, which involves the crafting of immediate or long-term concrete goals about the future or fantasizing about what could happen. In our review, of the six studies that examined future-oriented content of unprompted thoughts, five reported a relationship between future-oriented thoughts and increased positive mood or decreased negative mood (Beaty et al., 2019; Ji et al., 2022; Miś & Kowalczyk, 2021; Nyklíček et al., 2021; Ruby et al., 2013). One study used a postrunning questionnaire to capture the content of unprompted thought and found future-oriented thoughts were uniquely related to improved mood postrun compared to prerun (Miś & Kowalczyk, 2021). Another study used experience sampling in a task context and found that the negative relationship between future-oriented thoughts and negative mood is mediated by optimism (Ji et al., 2022). Finally, the last three studies used experience sampling in real life: Two reported that future-oriented thoughts were negatively associated with simultaneous negative mood (Beaty et al., 2019; Nyklíček et al., 2021), and the third study using time-lagged analysis revealed that future (and self-related) unprompted thoughts were uniquely associated with improved subsequent mood in the positive range (Ruby et al., 2013).

The only study that did not find a significant effect of the temporal focus of thought (as characterized by past, present, and future biases) on current mood (Spronken et al., 2016) used experience sampling in real life, but they did not examine the specific impact of future-oriented thought. Taken together, these studies provide evidence for the relationship between future-oriented thoughts and improved affective well-being as indexed by mood states.

Ruminative Thoughts. Given its prevalence in mood disorders, rumination is a type of thought that has been commonly examined in the context of unprompted thoughts and affective well-being. As rumination is characterized by repetitive, often self-focused thoughts, we considered it as a type of unprompted thought. Ruminative thought can also occur outside of the context of unprompted thought; for instance, rumination can be elicited by an external stimulus. Therefore, although studies have also examined rumination more broadly, our review considered studies that

examined rumination in the context of unprompted thought such that no experimental stimuli were presented to elicit rumination. All three studies that examined unprompted ruminative thoughts have reported a relationship to worse affective well-being (Cuper et al., 2011; Kuehner et al., 2017; Vannikov-Lugassi & Soffer-Dudek, 2018). For example, using experience sampling in the real world, one study reported that uncontrollable rumination predicted higher levels of negative mood (Kuehner et al., 2017). Another study using experience sampling found that, regardless of the temporal focus of the rumination, it positively correlates with depression, anxiety, and stress (Vannikov-Lugassi & Soffer-Dudek, 2018). Similarly, using experience sampling in a task context, Cuper et al. (2011) reported a positive relationship between rumination and negative affect. Therefore, these studies converge on the notion that rumination in the context of unprompted thought is associated with worse affective well-being in the general population.

Conceptualization of Unprompted Thought

Maladaptive Daydreaming. One characterization of unprompted thought concerns the frequency of these thoughts and one's inability to disengage from them. Referred to as maladaptive daydreaming, it has been defined as "immersive and addictive imagination activity that leads to distress because it hinders social, occupational, and academic performance" (Somer et al., 2016, p. 3). This phenomenon has been assessed primarily with the Maladaptive Daydreaming Scale (Somer et al., 2016). All six studies that examined maladaptive daydreaming have reported that it is related to problems with affective well-being (Abu-Rayya et al., 2019, 2020; Dujić et al., 2020; Musetti et al., 2021, 2023; Soffer-Dudek & Somer, 2018). One study (Dujić et al., 2020) found that maladaptive daydreaming tendencies were positively related to symptoms of psychological distress as assessed by the Clinical Outcomes in Routine Evaluation–Outcome Measure problems/symptoms subscale (as indexed by items such as "I felt tense, anxious, and nervous" or "I am unhappy"); but it was not significantly related to the subjective well-being deficits subscale (as indexed by items such as "I have felt okay about myself"). Three other studies compared individuals who were deemed to show clinical levels of maladaptive daydreaming and those who did not meet criteria based on their response on the same scale (Abu-Rayya et al., 2019, 2020; Musetti et al., 2021, 2023). They found that the maladaptive daydreamers showed reduced life satisfaction and heightened levels of depression, anxiety, and stress. Similarly, another study found correlations between maladaptive daydreaming and worse affective well-being assessed over 1 year apart (Musetti et al., 2023). These longitudinal results of maladaptive daydreaming were corroborated by a study that examined more immediate experiences of maladaptive daydreaming and their relation to affective well-being (Soffer-Dudek & Somer, 2018). Specifically, using measures that were restricted to a self-report based on their experiences in the last 24 hr, they found that, on days when maladaptive daydreaming was more intense, participants experienced higher levels of depression, anxiety, social anxiety, and negative emotion and lower levels of positive emotion. They also found that increased levels of maladaptive daydreaming on a given day were associated with increased negative emotions the next day. Together, these findings converge on the notion that unprompted thought conceptualized as maladaptive daydreaming is associated with worse affective well-being.

Freely Moving Thoughts. The primary characterization of unprompted thought has thus far been task-unrelated thought. More recent theoretical and empirical work has revealed another type of unprompted thought that can be characterized by its freedom of movement between mental states (Christoff et al., 2016; Mills et al., 2018). Specifically, freely moving thought is characterized by thoughts that move from one topic to another without strong constraints on the content of a given mental state (Mills, Porter, et al., 2021; Thiemann et al., 2023). These thoughts contrast with those that are focused on a given task (e.g., when writing a manuscript) or stuck on a personal issue (e.g., when we cannot disengage from thinking about a family conflict). Using this conceptualization, three studies have found that freely moving thought is positively correlated with affective well-being; in other words, higher levels of freely moving thoughts were associated with more positive concurrent affect (Mills, Porter, et al., 2021; Sikka et al., 2021; Thiemann et al., 2023)—providing evidence that not all unprompted thought is harmful for affective well-being.

Time-Lagged Analysis

An important consideration regarding the relationship between unprompted thought and affective well-being concerns the direction of causality. This can be appropriately addressed using time-lagged analysis combined with experience sampling, which enables the examination of whether the occurrence of unprompted thought predicts later affect or mood, or vice versa (as captured by the next experience sampling probe).

All five studies implementing time-lagged analysis examined whether unprompted thought was associated with future affective or mood states, and they reported variable results. One study conducted in a laboratory setting found that task-relatedness of thought negatively predicted a reduction in later mood (Ruby et al., 2013); in other words, higher compared to lower levels of task-unrelated thoughts were associated with more negative later mood. The authors caveat this overall relationship based on thought content: If the content was past- and other-focused, subsequent mood was more negative, whereas future- and self-focused thoughts led to an improvement in subsequent mood. Two studies conducted in the real world reported mixed findings: Higher levels of task-unrelated thought in general were associated with an increase in positive affect and decrease in negative affect at the next probe in one study (Welz et al., 2018) and more negative affect in another study (Killingsworth & Gilbert, 2010). One methodological consideration is the length of the time-lag between thought probes. In these two studies, probes were randomly dispersed hours apart throughout the day (Welz et al., 2018) or across days (Killingsworth & Gilbert, 2010), making it somewhat difficult to ascribe mechanistic explanations for links in such ephemeral states.

To address this limitation, two other studies specifically designed each probe at a given time point to be followed by a second probe that occurred either 15 min later (Poerio et al., 2013) or 8–12 min later (Mills, Porter, et al., 2021). This approach was argued to more optimally assess the temporal relationship between unprompted thought and affective states with minimal influence in the interim interval (Poerio et al., 2013). Both studies controlled for concurrent affect in these analyses, which rules out the alternative explanation that future affective states were solely attributable to prior affective states. Using this finer scale time-lagged analysis, both studies found

that task-unrelated thought did not predict future feelings of sadness and anxiety (Poerio et al., 2013) or subjective affective valence (Mills, Porter, et al., 2021).

Multiple studies also examined whether current affective or mood states predicted later episodes of unprompted thought (Killingsworth & Gilbert, 2010; Mills, Porter, et al., 2021; Poerio et al., 2013; Ruby et al., 2013). Among these four studies, two controlled for concurrent unprompted thought while predicting subsequent unprompted thought in their analyses (Killingsworth & Gilbert, 2010; Ruby et al., 2013). Two studies found that sadness (Poerio et al., 2013) and lower levels of mood (Ruby et al., 2013) were associated with subsequent higher levels of task-unrelated thought. In contrast, two other studies (Killingsworth & Gilbert, 2010; Mills, Porter, et al., 2021) did not observe a significant relationship between affective valence and future task-unrelated thought. Given the somewhat mixed findings that may have resulted from differences in analysis approaches (e.g., length of the time lag between probes and accounting for concurrent unprompted thought), these time-lag analyses suggest the directional relationship between unprompted thought and affective well-being is not robust, and they support the notion that content may play a role in the relationship between unprompted thought and affective well-being.

Interim Summary of Qualitative Review

Our qualitative review revealed additional findings that further describe the nuanced relationship between unprompted thought and affective well-being. In terms of thought content, future-oriented thought was often associated with positive affect. Different conceptualizations of unprompted thought led to opposing relationships: Maladaptive daydreaming was associated with worse affective well-being, whereas freely moving thought was associated with positive affect. Finally, studies using time-lagged analysis have reported mixed findings; yet those using a more fine-tuned analytic approach have indicated that unprompted thought did not predict future negative mood.

General Discussion

The current systematic review and meta-analysis synthesized 76 reports that examined the association between unprompted thought and affective well-being. Although our meta-analyses indicated a general negative relationship between the occurrence of unprompted thought and affective well-being, this seemingly robust relationship changes in magnitude and direction when considering different aspects of the phenomenon and different methods used for assessment. Whereas this finding applies to negative unprompted thought, positive unprompted thought shows an opposite pattern characterized by its association with improved affective well-being. This relationship also changes in magnitude as a function of how the unprompted thought was initiated, as exemplified by the finding of unintentional unprompted thought being more strongly related to reduced affective well-being than intentional unprompted thought. Remarkably, this negative relationship between unprompted thought and affective well-being only holds true in questionnaire studies and is not significant in studies using experience sampling in both laboratory and real-life settings, suggesting that the methodological approach used in assessing these relationships is an important factor. Our qualitative review further contextualizes these findings by revealing that unprompted thought is not always associated with worse affective well-being (as it does during rumination or maladaptive daydreaming); rather, it can also be associated with improved affective well-being during future-oriented and freely moving thoughts. These results collectively summarized in Figure 2 indicate that the relationship between unprompted thought and affective well-being is contingent upon the content and type of the thoughts, as well as the methodological and analytic approaches implemented, highlighting the importance of considering these factors in establishing the relationship between unprompted thought and affective well-being. We discuss the theoretical and applied implications of this conclusion below.

Overall Relationship Between Unprompted Thought and Affective Well-Being

In our meta-analysis that involved all measurements, there was an overall negative association between unprompted thought and affective well-being as reported in Table 2. Consistent with the dominant narrative in the literature, this suggests that unprompted thought appears to be associated with worse affective well-being when disregarding the content or types of unprompted thought as well as methodological approaches. At the same time, our analyses provided important insights into the varying consistency of this relationship—namely, that it is rather dependent on a set of moderators, which revealed a different relationship between unprompted thought and affective well-being. We discuss these moderators in turn in the subsequent section.

This negative association was observed for positive aspects of affective well-being (including positive affect; e.g., Crosswell et al., 2020; Miś & Kowalczyk, 2021, general well-being; e.g., Magan, 1985; Sugiura & Sugiura, 2020, and life satisfaction; Johannes et al., 2018; Mar et al., 2012) and negative aspects of affective well-being (including negative affect; Carciofo & Jiang, 2021; Franklin et al., 2013, depression; Seli et al., 2019, and anxiety; Kruger et al., 2020; Soffer-Dudek & Somer, 2018). Given evidence supporting the characterization of positive and negative affective measures as separate dimensions (Headey et al., 1984; Ryff et al., 2006), such distinction suggests that unprompted thought is implicated in changes in both dimensions of affective well-being. The effect size for unprompted thought and negative measures is nonetheless larger than that of the positive measures, indicating that unprompted thought has a larger effect on increasing negative affect and depression than reducing positive affect and life satisfaction.

Content of Unprompted Thought and Affective Well-Being

Although unprompted thought is generally associated with reduced affective well-being, our meta-analyses and qualitative review indicate that the content and type of such thoughts play a critical role in determining the magnitude or direction of this relationship. Notably, examining the content of these thoughts revealed strikingly opposing patterns. Our meta-analysis results and qualitative review indicated that negative unprompted thoughts were associated with worse affective well-being. This includes negatively valenced task-unrelated thoughts (Crosswell et al., 2020; Miś & Kowalczyk, 2021) and daydreams characterized by fear or guilt (Giambra & Traynor, 1978; Magan, 1985) as shown in our

meta-analysis. Our qualitative summary also revealed similar patterns in which ruminating thoughts are associated with reduced affective well-being. These findings corroborate the longstanding pattern observed in populations with mood disorders, characterized by a cycle of negative thoughts followed by negative affective states (Kircanski et al., 2018; Moberly & Watkins, 2008; Teasdale, 1983). In contrast, positive unprompted thoughts were associated with improved affective well-being. This includes positively valenced task-unrelated thoughts (Crosswell et al., 2020; Miś & Kowalczyk, 2021) and daydreams characterized by acceptance and curiosity (Giambra & Traynor, 1978; Gold & Minor, 1983; Magan, 1985), as reported in our meta-analysis. Similarly, our qualitative summary revealed that future-oriented thoughts were also associated with improved affective well-being. These findings are broadly consistent with reports of a relationship between temporal thought patterns and objective markers of affective well-being (Engert et al., 2014). Although the original studies often did not reveal how positive or negative unprompted thought compare to task-focus thoughts, they do underscore how the content of unprompted thought determines whether it positively or negatively relates to affective well-being. Together, these findings support the content regulation hypothesis (Andrews-Hanna et al., 2014; Smallwood & Andrews-Hanna, 2013), which proposed that the content as opposed to the mere occurrence of task-unrelated thought determines its outcomes. This opposing pattern between positive and negative thoughts provides evidence that thought content contributes to the direction of the relationship between unprompted thought and affective well-being.

In addition to content, the type of unprompted thought also plays a role in their relationship to affective well-being. Specifically, our meta-analysis revealed that not only were unintentional unprompted thoughts related to worse affective well-being, but they were also associated with significantly worse consequences compared to intentional thoughts. These patterns are consistent with past studies suggesting that unintentional compared to intentional unprompted thought, and specifically those unrelated to the ongoing task, is more strongly associated with negative outcomes including those beyond affective well-being, such as symptoms of ADHD (Seli et al., 2015). The increased severity in affective outcomes of unintentional task-unrelated thought has been previously attributed to its connection with attention control failures (Carriere et al., 2013; Seli et al., 2016), which has been associated with measures of reduced affective well-being (Carriere et al., 2008). The occurrence of unprompted thought engaged in an unintentional manner is also more likely to be influenced by the severity of one's personal concerns (Klinger & Cox, 2011), which is also strongly connected to affective well-being. These results together indicate that intentionality of unprompted thought modulates the magnitude of relationship to affective well-being.

Our qualitative summary revealed other types of thoughts that differentially relate to affective well-being. For example, maladaptive daydreaming as defined by excessive unprompted thought that occurs beyond one's control was associated with worse affective well-being (Abu-Rayya et al., 2019, 2020; Dujić et al., 2020; Musetti et al., 2021, 2023; Soffer-Dudek & Somer, 2018). The uncontrollability that characterizes maladaptive daydreaming is in line with the failure in attentional control characterization of unintentional task-unrelated thought (Carriere et al., 2013) and provides a potential explanation for why they both converge on a negative relationship to affective well-being. In contrast, thoughts that freely move from one topic to another were associated with improved concurrent affect (Mills, Porter, et al., 2021; Sikka et al., 2021; Thiemann et al., 2023) as well as subsequent affect (Mills, Porter, et al., 2021). These results are consistent with the broaden-and-build theory (Fredrickson, 1998, 2001), which purported that positive affect is associated with an increased scope of attention across different cognitive domains. This dovetails with the idea of freely moving thought, which is defined by a freedom of movement in thoughts across topics and a flexibility in shifting between mental states with minimal constraints (Christoff et al., 2016). Notably, as only a handful of reports to date have examined and revealed the relationship between freely moving thought and improved affective well-being (Mills, Porter, et al., 2021; Sikka et al., 2021; Thiemann et al., 2023), future studies are needed to replicate and elucidate this relationship. Taken together, these findings extend the content regulation hypothesis and propose that, in addition to the mere occurrence or content of unprompted thought, the manner in which the thought is initiated and unfolds over time can also influence its affective outcomes.

Methodological and Analysis Approach in Assessing Unprompted Thought and Affective Well-Being

Beyond the content and type of unprompted thought, its relationship with affective well-being also changes as a function of the methodological approach. In our meta-analysis, unprompted thought was significantly associated with worse affective well-being only when assessed via questionnaires. This effect was observed for all types of questionnaire-based measures that capture affective or mood states as well as psychiatric symptoms and quality of life, with no significant difference between them. In contrast, the relationship between unprompted thought and affective well-being was not significant when assessed via experience sampling. Notably, questionnaire-based measures were associated with significantly worse consequences relative to experience sampling and posttask questions measures, with effect sizes that were nearly 6 times that of experience sampling and posttask questions. Given the difference in sample size across studies however (questionnaire-based approach, $n = 43$; experience sampling approach, $n = 14$; posttask questions, $n = 4$), future reviews with more comparable sample sizes are needed to determine whether these differences are robust. These sets of findings together support the notion that the methodological approach used in assessing unprompted thought and affective well-being plays an important role in the magnitude and significance of the relationship between these variables.

The characteristics of these methodological approaches offer some insight into the nature of the relationship between unprompted thought and affective well-being. Questionnaires often ask participants to report on their experience retrospectively across a preceding time interval (e.g., over the past 2 weeks). This approach assesses one's tendency to engage in certain behavior that typically occurs over a prolonged time window and captures the average experience via retrospective recall, which may be subject to varying levels of memory inaccuracies, recall bias, and a tendency to respond based on the peak experience or the most recent experience across individuals. In contrast, the experience sampling approach asks participants to report on their ongoing experience in the moment, which alleviate some of the aforementioned issues of recall bias and accuracy (Shiffman et al., 2008). This approach provides a

detailed glimpse into one's momentary experience, characterizing their thoughts and affect at that precise moment as they unfold over time. Of importance, our meta-analysis suggests that the relationship between unprompted thought and affective well-being was only significant when assessing overall tendencies with questionnaires.

In our qualitative summary, we found that studies implementing time-lagged analysis on experience sampling data revealed mixed findings of the relationship between unprompted thought and affective well-being depending on the time-lag difference between thought probes. Across the five studies, two strategically scheduled the second prompt used for implementing the time-lagged analysis to take place only 10–15 min after the initial one, which more precisely captures the temporal link between unprompted thought and affective states from the initial prompt to the second prompt with minimal influence in the interim interval. Both reported null findings (Mills, Porter, et al., 2021; Poerio et al., 2013). The remaining three studies that did not implement this fine-tuned analysis approach reported mixed findings (Killingsworth & Gilbert, 2010; Ruby et al., 2013; Welz et al., 2018). Because assessments in these three studies were obtained up to hours apart, it is possible other factors beyond unprompted thought may have influenced the subsequently assessed affective states in the interim. Although more studies using the fine-tuned analysis approach are needed to clarify these mixed findings, one important consideration lies in the different tasks that participants are performing during the assessments as they may moderate the relationship between unprompted thought and affective well-being. For instance, our tasks in the real world tend to vary substantially at any given moment in time throughout the day in their level of interest, difficulty, demandingness, and its alignment with our overarching goals; in contrast, tasks in lab-based settings are often highly constrained and monotonous, similar in interest and difficulty across the time of assessment, and usually do not represent our experiences in daily life. Beyond examining these transient effects, future studies should also consider examining the causal relationship between unprompted thought, affective well-being, and potential moderators such as cognitive profiles that operate on longer temporal scales.

Practical and Clinical Implications

That the relationship between unprompted thought and affective well-being can be modulated by numerous factors has important practical and clinical implications. First, our meta-analyses revealed that unprompted thought accounts for approximately 3% of variance in affective well-being (based on the overall effect size $\bar{r} = -.18$) and up to 7% of variance for negatively valenced unprompted thoughts (based on effect size $\bar{r} = -.27$). These effect sizes are comparable to effect sizes from meta-analyses examining other determinants of affective well-being, including economic status (r = .10–.28, Howell & Howell, 2008) and academic achievements (r = .16, Bücker et al., 2018). Accordingly, although the theoretical importance of these effect sizes may be categorized as small (Hojat & Xu, 2004), the practical or clinical magnitude of the relationship between unprompted thought and affective well-being is similar to other reported determinants of affective well-being.

Second, our findings reveal that the types of thoughts we have are associated with how we feel, suggesting the possibility of regulating our thoughts such that it positively impacts our affective well-being. This potential to enhance regulation of our thoughts can be beneficial for the general and clinical populations alike. For instance, we can work toward improving our ability to direct our thoughts away from content or thought types (e.g., rumination) that are associated with negative affect and toward content or thought types (e.g., future-oriented thoughts and freely moving thoughts) that are associated with positive affect. In fact, changing one's thoughts about specific events that elicit clinical symptoms is already incorporated in certain components of common types of therapies for clinical disorders. One illustration is by implementing cognitive reappraisal, which involves reframing how we think of a situation in order to change how we feel, to reduce clinical symptoms of mood disorders (Gross, 2015). Another example in clinical settings involves practicing mindfulness to reduce repetitive thinking (Gu et al., 2015), which is associated with negative affect. Although in clinical settings, the targeted change tends to focus on thoughts related to the clinical symptoms, our findings suggest that this capacity to regulate thoughts may have broader implications across contexts and individuals when applied to unprompted thoughts in general.

These potential implications should be considered with the following caveats in mind. Given the magnitude of correlations reported in our meta-analysis and the inherent limitations with group-level statistics, our results do not suggest that any individuals engaging in a particular thought would feel one way or another with certainty. There may be numerous other factors at play, which we elaborate on in the next section on future directions. Related to these factors is the possibility of third variables that might partially account for the relationship between unprompted thought and affective well-being. From a clinical perspective, there may be other preexisting variables that play a role in this relationship. As an example, individuals with ADHD have been characterized by both poor attentional control (Friedman-Hill et al., 2010) and increased unintentional unprompted thought (Seli et al., 2016). Given that our findings indicate that a lack of thought controllability appears to be associated with reduced affective well-being, it is possible that the poor attentional control in individuals with ADHD might explain how their unprompted thought is related to affective well-being. Future studies, especially those examining clinical populations, need to take into account existing conditions (e.g., levels of executive functions) that can play a role in the relationship between unprompted thought and affective well-being both on short and long timescales.

Types of Research Evidence

Finally, it is important to consider the types of research evidence as well as the quality of evidence represented in the included reports in this review. In terms of types of research evidence, the majority of our studies used questionnaires, whereas only a handful of studies used the experience sampling approach (as summarized in Table 1). Moreover, more than twice as many studies examined unprompted thoughts characterized by negative valence as opposed to positive valence, and more studies focused on negative aspects than positive aspects of affective well-being. The disproportionately high number of studies that used questionnaires and focused on negative thought valence and negative affective measures may partially explain the dominant narrative that unprompted thought is negatively associated with affective well-being. Nonetheless, our findings indicate that, among the few studies that examined other types of thoughts

(e.g., positively valenced thoughts, future-oriented thoughts and freely moving thoughts), they revealed a positive relationship between these types of thoughts and affective well-being. These contrasting patterns between unprompted thought and affective well-being once again highlight the importance of considering the content and types of thoughts as well as methodological approaches. For example, future theoretical and empirical work should consider a balanced view by examining both positive and negative unprompted thoughts and affective well-being measures or acknowledge that their focus on one measure may introduce a biased view on the relationship. In terms of quality of evidence, the reports included in our review had moderate-to-strong scores for all quality assessment criteria. Given that these scores were also not associated with effect sizes, it is unlikely that the quality of evidence impacted our conclusions on the relationship between unprompted thought and affective well-being. We elaborate on these observations in the Supplemental Material.

Emerging Directions for Understanding Unprompted Thought and Affective Well-Being

A primary message of our review is that unprompted thought is not uniformly harmful for our affective well-being, despite the negative reputations associated with mental states like mind wandering. Because the relationship is quite complex, a one-to-one mapping between unprompted thought and affective well-being for purposes of generalization or recommendations is not readily apparent. Our results and discussion so far suggest that, with respect to the dominant existing methods, accounting for content, context, and methodological approach is critical for understanding the nuanced relationship between unprompted thought and affective well-being. Yet simply assessing more information is not necessarily the only path forward; as such, we outline some possible new directions for studying the nature of our unprompted thought and how it relates to affective well-being.

Conceptualizations of Unprompted Thought

Task-Unrelated Thought: Are We Setting Ourselves up for Negative Attributions?

One worthwhile goal is to consider how our theoretical assumptions behind unprompted thought may shape our methodological choices and even impact our findings. Most of the studies we reviewed focused on task-unrelated thought, and most of the corresponding theoretical assumptions and methodologies typically tend to imply that (a) a single defined goal exists and (b) unprompted thought interrupts the pursuit of that goal. These may have the unintended consequence of adopting a deficit-based approach at the outset; if such thoughts are not perceived as productive, individuals feel less positive. This assumption is inherently incorporated into the dominant methods we use to assess this relationship, both in the lab and in everyday life—with most studies asking participants about their task-unrelatedness or how often they struggle with paying attention to a task.

Asking participants whether they are on-task versus off-task inherently assumes they have one defined task, which does not always reflect our daily experiences where we typically have multiple ongoing tasks and goals (Murray et al., 2020). There may be a downstream effect such that drawing attention to the fact that we are no longer attending to our ongoing task and/or goal implicitly feels more negative—aligning with a conventional societal view that off-task states are less productive and thus less desirable. It is thus possible that simply drawing attention to the fact that we are off-task could lead to negative affect. This pattern may especially emerge in lab-based tasks when researchers explicitly define what the task and goal is for the participant (e.g., reading comprehension or target detection). Any thoughts that violate that instruction may thus feel less positive due to their perceived failure to comply especially in an experimental setting. To this end, it may not be necessarily being off-task that is associated with negative affect per se but rather the evaluation that we failed to achieve the goal as well as not being in "control" of our own thoughts (see more discussion on the notion of control below). Indeed, our meta-analysis already suggests that unprompted thoughts tend to have a more negative association with affective well-being when they are unintentional versus intentional. One way to circumvent this issue involves automated methods of assessing unprompted thought, which would not draw explicit attention to the failure. To that end, past research has built accurate machine learning classifiers that can detect the occurrence of task-unrelated thought using features like eye gaze, electroencephalogram, and reaction times (Dong et al., 2021; Faber & D'Mello, 2018; Hutt et al., 2017; Mills et al., 2016). Such automated detectors may eventually reach a place where they can be reliably applied in experiments to make real-time assessments about whether an individual is off-task without needing to interrupt the task for self-reports (Mills, Gregg, et al., 2021). As studies using this approach to study unprompted thought have been quite limited to date, future studies can explore the use of machine learning to detect unprompted thought in the context of affective well-being.

Another point of consideration for future work is thus to consider the utility of unprompted thought so that the current implicit focus on its negative impact may be matched with some of its positives. After all, we have evolved in such a way that we can and do ubiquitously experience unprompted thought, regardless of its conceptualization. Indeed, many speculations exist for their functionality—spanning creativity and insight (Baird et al., 2012; Zedelius et al., 2021), improving semantic memory (Mills et al., 2018), elevating current concerns (Klinger, 1987), and autobiographical planning (Baird et al., 2012). We suggest that further advancements in understanding their utility broadly and their role in affective well-being specifically can be made by considering different conceptualizations, thereby adopting different assumptions and corresponding measurements. To that end, we describe several suggestions along these lines, which all do not explicitly impose an assumption about the presence of a task.

Alternative Conceptualizations and Measurements

We first note that focusing on the task-unrelated nature of unprompted thought can be informative in many cases. Sometimes, the goal may be to understand how well individuals can sustain their attention to a task and how various affective well-being markers may relate to this ability. But the goal may differ, and by solely focusing on task-unrelated thought, we may end up—or perhaps we already have—with a negative bias toward how unprompted thought relates to our affective well-being. Other conceptualizations that assess different features of thoughts beyond task-relatedness (which we elaborate below) may help paint a more nuanced picture of the types

of unprompted thought that have more positive outcomes on affective well-being and thus help us better understand their utility.

Beyond single features, recent studies have also implemented a novel approach to examine coexisting features of unprompted thought characterized as thought patterns (Konu et al., 2021; Vatansever et al., 2020). Specifically, this approach referred to as multidimensional experience sampling involves asking multiple questions that capture different aspects of unprompted thought. A latent variable analysis is typically implemented on the response to these multiple questions, which reveals latent thought patterns that provides a comprehensive portrayal of one's ongoing thoughts (Turnbull et al., 2019; Wang et al., 2018). These thought patterns can then be mapped onto different affective well-being correlates.

Fantastical Thinking. One example of this is the idea of fanciful or fantastical thinking (Klinger, 2013). This version of unprompted thought is less often studied in the literature and may represent a more prototypical form of daydreaming. For example, Singer (1975) referred to this as positive constructive daydreaming, which they suggest involved imaginative, playful, wishful imagery, and planful, creative thought (Singer & Antrobus, 1963). In fact, some individuals report deliberately taking time out of their day to engage in such types of thoughts (Bigelsen & Schupak, 2011). The positive aspects proposed by Singer have been captured in more recent work (Schooler et al., 2011; Zedelius et al., 2021), but still relatively few studies have explicitly focused on this dimension. Although past studies have predominantly conceptualized unprompted thought as task-unrelated thought, we emphasize that fantastical thinking does not have to be task-unrelated. As an example, you can have a fantastical thought about a dinosaur up ahead on the road while driving, which is not strictly unrelated to the task. Such thoughts may be important to consider when empirically studying the relationship between unprompted thought and affective well-being, as Singer (1966) suggests this pattern of thinking helps with social skills, alleviating boredom, and of relevance provides feelings of pleasure (McMillan et al., 2013).

Dynamics of Thought. Another future direction involves examining the dynamics of how thoughts unfold over time (Christoff et al., 2016; Irving, 2021). As described in the dynamic framework of spontaneous thought, the way in which our thoughts unfold may help explain how thoughts relate to our affective well-being. Specifically, the authors proposed that our thoughts may be constrained in two ways. Thoughts may be constrained by cognitive control mechanisms, in which our thoughts are directed to a particular topic (e.g., making plans for an upcoming vacation). Thoughts may also be constrained by salience mechanisms, in which thoughts are focused on salient information or stimuli and are difficult to disengage from (e.g., being "stuck" on an earlier argument with a loved one or a fly buzzing in the room). This latter category of thought is reminiscent of rumination and maladaptive daydreaming, both of which have also been associated with reduced well-being (Abu-Rayya et al., 2019; Cuper et al., 2011; Kuehner et al., 2017; Soffer-Dudek & Somer, 2018). It is also exemplified by individuals with tendencies for ruminative thoughts characterized by a stationary pattern that persists over time who report worse affective well-being (Welz et al., 2018).

In contrast to the examples above, thoughts with low levels of constraints may feel more unguided and freely move from one topic to another with no overarching direction (e.g., from planning your dinner tonight to reminiscing your last vacation to predicting who will win the championship). This category of thought has been associated with more positive affect (Mills, Porter, et al., 2021; Thiemann et al., 2023) and is reminiscent of the pervasive unconstrained thoughts observed in individuals with ADHD (Alperin et al., 2021). Kam et al. (2021) recently proposed a set of dynamic experience sampling measures that could be used to gauge various levels of constraints, but it may also be captured using other protocols such as think-aloud paradigms, whereby participants simply verbalize their ongoing thoughts (Raffaelli et al., 2021; Sripada & Taxali, 2020). With these latter methodological approaches, the goal is to capture how thoughts unfold and how they are related to each other over time rather than focusing on momentary snapshots only as afforded by experience sampling, which may provide unique insights into its relationship with affective well-being.

Perceived Control Over Thought Initiation. One other less understood facet of how unprompted thought relates to affective well-being is the onset/initiation of the thought(s) rather than the phenomenology of the thought once it has occurred (Irving, 2021; Smallwood, 2013). The idea of perceived control over the initiation of a thought may be particularly relevant, as past studies have also shown that a sense of control is associated with positive outcomes in affective well-being (Lachman & Weaver, 1998; Southwick & Southwick, 2018). Although these studies have examined the perspective of control over circumstances in daily life, it is conceivable that similar outcomes are associated with a sense of control over thought initiation.

This sense of control broadly underlies two types of unprompted thought we have already discussed, including intentionality of and deliberate constraints on thoughts. Characterized as thoughts that occur spontaneously without one's control, unintentional task-unrelated thought has been shown to be associated with reduced well-being compared to intentional task-unrelated thought (Seli et al., 2015). In contrast, deliberately constrained thoughts rely on cognitive control and have been associated with positive affect (Thiemann et al., 2023). Taken together, we propose that future studies should consider asking how the thought was perceived to be initiated, in addition to the content or nature of thought postinitiation. As an example, freely moving thought might be associated with even more positive affect if someone deliberately chooses to "let their mind wander" compared to if they unintentionally got lost in their thoughts.

The Role of Context

In terms of the context in which unprompted thought occurs, few studies to our knowledge have specifically examined its impact on their relationship with affective well-being (Kuehner et al., 2017). Past work has mainly compared the lab setting with the real world and revealed that the occurrence of task-unrelated thought and its impact on task performance were similar in both settings (McVay et al., 2009). Comparing the local situational context and the broader societal context in reference to the COVID-19 pandemic, one study also found that patterns of thought (Mckeown et al., 2021) appear to be consistent across the local contexts but differed before and during the pandemic as assessed in the real world. Given these sparse findings, whether the relationship between unprompted thought and affective well-being differs across contexts remains largely unexplored. One important future direction therefore would involve accounting for the context in which these thoughts occur, which can be assessed by inquiring participants' ongoing task and surrounding

environment. A related future direction involves mapping the similar or different features of thoughts that may occur across contexts, such as in daily life and in an experimental setting, in order to create a comprehensive picture of unprompted thought. An experience sampling approach may be most optimal for addressing these questions as they circumvent issues of recall bias and accuracy associated with retrospective measures.

Limitations

Our results should be considered with two sets of limitations in mind, one that concerns the original studies and one that concerns our protocol. In terms of the original studies, one of the main considerations concerns the variable definitions and measures of unprompted thought and affective well-being. Notably, inclusion of these studies in the overall meta-analysis inherently disregards the subtle or major differences between them. Our significant findings of the different ways in which unprompted thought relates to affective well-being across studies however are a testament to the robustness of this phenomenon regardless of the measures used to index these constructs. Another limitation is the sample size: The insufficient number of studies examining specific content or types of unprompted thought using a given methodology precluded their inclusion in the meta-analysis. For example, several studies examining maladaptive daydreaming all revealed a strong association with reduced affective well-being (Abu-Rayya et al., 2019; Musetti et al., 2023; Soffer-Dudek & Somer, 2018). Although these findings are in line with our result involving negatively valenced unprompted thought, we did not have enough samples to obtain reliable results through meta-analysis on this specific type of unprompted thought. An additional limitation involves the generalizability of our results based on the original studies as well as our approach to data synthesis. As summarized in Supplemental Table 3, 15 out of the 76 reports included in this review were conducted outside of Western countries. Given the original studies were primarily conducted in communities characterized as Western, industrialized, educated, rich, and democratic (Henrich et al., 2010), results may not generalize to individuals not in Western, industrialized, educated, rich, and democratic societies. It therefore remains to be determined if and how the relationship between unprompted thought and affective states may be modulated by social factors, such as culture, socioeconomic status, and the political system in which one's life is embedded. Moreover, as our search was restricted to English terms, this mono-language bias limits our results to be generalized only to English speaking individuals. Our search nonetheless resulted in three reports reported in languages other than English, including Arabic, German, and Japanese. With the development of professional translation services in recent years (e.g., Google Translate), future reviews and meta-analyses should consider non-English reports to maximize inclusivity of studies implemented in communities that do not commonly speak or report in English. Given that language shapes our thoughts (Boroditsky, 2001), it is possible that the language we speak may differentially impact the relationship between unprompted thought and affective states. Although this topic is beyond the scope of the current review, this is an important avenue for future research.

Other considerations related to our search protocol involve publication bias. In addition to examining publication bias in our meta-analyses, another potential source lies in our search protocol. Specifically, although we included gray literature that emerged in our search, we did not actively seek out gray literature. This could potentially lead to publication bias such that we may have missed unpublished studies with null findings that did not appear in our search in various databases. A related limitation involves the limited terminology used in our search. Instead of entering every possible affective well-being term in our searches (e.g., anxiety, depression, life satisfaction, rumination, stress, worry), we instead opted to focus on more general terms (e.g., well-being). Although our pilot search indicated these terms captured the core reports in the review, this may have limited the number of studies that appeared in our search results.

Conclusions

Our systematic review and meta-analysis aimed to provide a comprehensive overview of the relationship between unprompted thought and affective well-being. In general, the occurrence of unprompted thought is associated with worse affective well-being. A closer inspection however reveals that only unprompted thought with negative content shows this relationship, whereas positively unprompted thoughts is associated with enhanced affective well-being. The methodological approach also plays a critical role, as this relationship was only observed in studies using questionnaires that capture the co-occurrence of comparatively prolonged characteristics, but not experience sampling that reveal transient features of our ongoing experience. This review therefore highlights the importance of considering the content, nature, and method of assessment of unprompted thought when examining its relationship with affective well-being. Future investigations examining different features of unprompted thought will offer a more nuanced picture that accurately captures when, how, and for whom this ubiquitous cognitive phenomenon influences our affective well-being.

References

References marked with an asterisk indicate studies included in this review.

*Abu-Rayya, H. M., Somer, E., & Knane, H. (2020). Maladaptive daydreaming is associated with intensified psychosocial problems experienced by female survivors of childhood sexual abuse. *Violence Against Women*, *26*(8), 825–837. https://doi.org/10.1177/1077801219845532

*Abu-Rayya, H. M., Somer, E., & Meari-Amir, S. (2019). The psychometric properties of the Arabic 16-item Maladaptive Daydreaming Scale (MDS-16-AR) in a multicountry Arab sample. *Psychology of Consciousness: Theory, Research, and Practice*, *6*(2), 171–183. https://doi.org/10.1037/cns0000183

Alperin, B. R., Christoff, K., Mills, C., & Karalunas, S. L. (2021). More than off-task: Increased freely-moving thought in ADHD. *Consciousness and Cognition*, *93*, Article 103156. https://doi.org/10.1016/j.concog.2021.103156

*Andrews-Hanna, J. R., Kaiser, R. H., Turner, A. E., Reineberg, A. E., Godinez, D., Dimidjian, S., & Banich, M. T. (2013). A penny for your thoughts: Dimensions of self-generated thought content and relationships with individual differences in emotional wellbeing. *Frontiers in Psychology*, *4*(4), Article 900. https://doi.org/10.3389/fpsyg.2013.00900

Andrews-Hanna, J. R., Smallwood, J., & Spreng, R. N. (2014). The default network and self-generated thought: Component processes, dynamic

control, and clinical relevance. *Annals of the New York Academy of Sciences*, *1316*(1), 29–52. https://doi.org/10.1111/nyas.12360

*Arch, J. J., Wilcox, R. R., Ives, L. T., Sroloff, A., & Andrews-Hanna, J. R. (2021). Off-task thinking among adults with and without social anxiety disorder: An ecological momentary assessment study. *Cognition and Emotion*, *35*(2), 269–281. https://doi.org/10.1080/02699931.2020.1830751

Baird, B., Smallwood, J., Mrazek, M. D., Kam, J. W. Y., Franklin, M. S., & Schooler, J. W. (2012). Inspired by distraction: Mind wandering facilitates creative incubation. *Psychological Science*, *23*(10), 1117–1122. https://doi.org/10.1177/0956797612446024

*Beaty, R. E., Seli, P., & Schacter, D. L. (2019). Thinking about the past and future in daily life: An experience sampling study of individual differences in mental time travel. *Psychological Research*, *83*(4), 805–816. https://doi.org/10.1007/s00426-018-1075-7

Bigelsen, J., & Schupak, C. (2011). Compulsive fantasy: Proposed evidence of an under-reported syndrome through a systematic study of 90 self-identified non-normative fantasizers. *Consciousness and Cognition*, *20*(4), 1634–1648. https://doi.org/10.1016/j.concog.2011.08.013

*Borella, E., Zavagnin, M., Ronconi, L., & De Beni, R. (2022). Cognitive and non-cognitive variables influencing age-related effect of mind wandering across the adult life span. *European Journal of Ageing*, *19*(2), 277–292. https://doi.org/10.1007/s10433-021-00637-3

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2021). *Introduction to meta-analysis* (2nd ed.). Wiley. https://doi.org/10.1002/9781119558378

Boroditsky, L. (2001). Does language shape thought? Mandarin and English speakers' conceptions of time. *Cognitive Psychology*, *43*(1), 1–22. https://doi.org/10.1006/cogp.2001.0748

*Branch, J. G. (2023). Individual differences in the frequency of voluntary & involuntary episodic memories, future thoughts, and counterfactual thoughts. *Psychological Research*, *87*(7), 2171–2182. https://doi.org/10.1007/s00426-023-01802-2

Bücker, S., Nuraydin, S., Simonsmeier, B. A., Schneider, M., & Luhmann, M. (2018). Subjective well-being and academic achievement: A meta-analysis. *Journal of Research in Personality*, *74*, 83–94. https://doi.org/10.1016/j.jrp.2018.02.007

*Carciofo, R. (2022). A time to wander: Exploring associations between components of circadian functioning, mind wandering typology, and time-of-day. *Biological Rhythm Research*, *53*(10), 1562–1586. https://doi.org/10.1080/09291016.2021.1972522

*Carciofo, R., Du, F., Song, N., & Zhang, K. (2014). Mind wandering, sleep quality, affect and chronotype: An exploratory study. *PLOS ONE*, *9*(3), Article e91285. https://doi.org/10.1371/journal.pone.0091285

*Carciofo, R., & Jiang, P. (2021). Deliberate and spontaneous mind wandering in Chinese students: Associations with mindfulness, affect, personality, and life satisfaction. *Personality and Individual Differences*, *180*, Article 110982. https://doi.org/10.1016/j.paid.2021.110982

*Carciofo, R., Song, N., Du, F., Wang, M. M., & Zhang, K. (2017). Metacognitive beliefs mediate the relationship between mind wandering and negative affect. *Personality and Individual Differences*, *107*, 78–87. https://doi.org/10.1016/j.paid.2016.11.033

*Cárdenas-Egúsquiza, A. L., & Berntsen, D. (2022). Sleeping poorly is robustly associated with a tendency to engage in spontaneous waking thought. *Consciousness and Cognition*, *105*, Article 103401. https://doi.org/10.1016/j.concog.2022.103401

*Caron, E. E., Drody, A. C., Hicks, L. J., & Smilek, D. (2022). The impact of a global pandemic on undergraduate learning experiences: One year later. *Trends in Neuroscience and Education*, *29*, Article 100184. https://doi.org/10.1016/j.tine.2022.100184

Carriere, J. S. A., Cheyne, J. A., & Smilek, D. (2008). Everyday attention lapses and memory failures: The affective consequences of mindlessness. *Consciousness and Cognition*, *17*(3), 835–847. https://doi.org/10.1016/j.concog.2007.04.008

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/Revue Canadienne De Psychologie Expérimentale*, *67*(1), 19–31. https://doi.org/10.1037/a0031438

*Choi, J., Catapano, R., & Choi, I. (2017). Taking stock of happiness and meaning in everyday life. *Social Psychological and Personality Science*, *8*(6), 641–651. https://doi.org/10.1177/1948550616678455

Christoff, K., Irving, Z. C., Fox, K. C. R., Spreng, R. N., & Andrews-Hanna, J. R. (2016). Mind-wandering as spontaneous thought: A dynamic framework. *Nature Reviews Neuroscience*, *17*(11), 718–731. https://doi.org/10.1038/nrn.2016.113

Christoff, K., Mills, C., Andrews-Hanna, J. R., Irving, Z. C., Thompson, E., Fox, K. C. R., & Kam, J. W. Y. (2018). Mind-wandering as a scientific concept: Cutting through the definitional haze. *Trends in Cognitive Sciences*, *22*(11), 957–959. https://doi.org/10.1016/j.tics.2018.07.004

*Clapper, J., Ware, S., Martinez, F. J., Benitez, K., & Koshino, H. (2021). Breath counting as a measure of sustained attention in mindfulness meditation and its effect on mood. *Psychology of Consciousness: Theory, Research, and Practice*. Advance online publication. https://doi.org/10.1037/cns0000311

*Crosswell, A. D., Coccia, M., & Epel, E. S. (2020). Mind wandering and stress: When you don't like the present moment. *Emotion*, *20*(3), 403–412. https://doi.org/10.1037/emo0000548

*Cuper, P. F., Robins, C. J., Bonner, M. J., Zachary Rosenthal, M., Steffens, D. C., & Strauman, T. J. (2011). *Investigating the effects of fantasy proneness and instructions to fantasize on sustained attention and mood during a laboratory task* [Doctoral dissertation, Duke University]. https://hdl.handle.net/10161/5626

*Deng, Y., Li, S., & Tang, Y.-Y. (2014). The relationship between wandering mind, depression and mindfulness. *Mindfulness*, *5*(2), 124–128. https://doi.org/10.1007/s12671-012-0157-7

Dong, H. W., Mills, C., Knight, R. T., & Kam, J. W. Y. (2021). Detection of mind wandering using EEG: Within and across individuals. *PLOS ONE*, *16*(5), Article e0251490. https://doi.org/10.1371/journal.pone.0251490

*Dujić, G., Anticevic, V., & Misetic, I. (2020). Contribution of maladaptive daydreaming to the level of psychological distress and coping strategies. *Social Psychiatry—the Journal of the Croatian Psychiatric Society*, *48*(1), 3–19. https://doi.org/10.24869/spsih.2020.3

Egger, M., Davey Smith, G., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *The BMJ*, *315*(7109), 629–634. https://doi.org/10.1136/bmj.315.7109.629

Engert, V., Smallwood, J., & Singer, T. (2014). Mind your thoughts: Associations between self-generated thoughts and stress-induced and baseline levels of cortisol and alpha-amylase. *Biological Psychology*, *103*, 283–291. https://doi.org/10.1016/j.biopsycho.2014.10.004

*Epel, E. S., Puterman, E., Lin, J., Blackburn, E., Lazaro, A., & Mendes, W. B. (2013). Wandering minds and aging cells. *Clinical Psychological Science*, *1*(1), 75–83. https://doi.org/10.1177/2167702612460234

Faber, M., & D'Mello, S. K. (2018). How the stimulus influences mind wandering in semantically rich task contexts. *Cognitive Research: Principles and Implications*, *3*(1), Article 35. https://doi.org/10.1186/s41235-018-0129-0

Fox, K. C. R., Andrews-Hanna, J. R., Mills, C., Dixon, M. L., Markovic, J., Thompson, E., & Christoff, K. (2018). Affective neuroscience of self-generated thought. *Annals of the New York Academy of Sciences*, *1426*(1), 25–51. https://doi.org/10.1111/nyas.13740

*Franklin, M. S., Mrazek, M. D., Anderson, C. L., Smallwood, J., Kingstone, A., & Schooler, J. W. (2013). The silver lining of a mind in the clouds: Interesting musings are associated with positive mood while mind-wandering. *Frontiers in Psychology*, *4*, Article 583. https://doi.org/10.3389/fpsyg.2013.00583

Fredrickson, B. L. (1998). What good are positive emotions? *Review of General Psychology*, *2*(3), 300–319. https://doi.org/10.1037/1089-2680.2.3.300

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, *56*(3), 218–226. https://doi.org/10.1037/0003-066X.56.3.218

Friedman-Hill, S. R., Wagman, M. R., Gex, S. E., Pine, D. S., Leibenluft, E., & Ungerleider, L. G. (2010). What does distractibility in ADHD reveal about mechanisms for top-down attentional control? *Cognition*, *115*(1), 93–103. https://doi.org/10.1016/j.cognition.2009.11.013

Galbraith, R. F. (1988). Graphical display of estimates having differing standard errors. *Technometrics*, *30*(3), 271–281. https://doi.org/10.1080/00401706.1988.10488400

*Giambra, L. M., Grodsky, A., Belongie, C., & Rosenberg, E. H. (1994). Depression and thought intrusions, relating thought frequency to activation and arousal. *Imagination, Cognition and Personality*, *14*(1), 19–29. https://doi.org/10.2190/JYYR-TWWL-TJHU-0VRG

*Giambra, L. M., & Traynor, T. D. (1978). Depression and daydreaming: An analysis based on self-ratings. *Journal of Clinical Psychology*, *34*(1), 14–25. https://doi.org/10.1002/1097-4679(197801)34:1<14::AID-JCLP2270340103>3.0.CO;2-%23

*Gold, S. R., Gold, R. G., Milner, J. S., & Robertson, K. R. (1986). Daydreaming and mental health. *Imagination, Cognition and Personality*, *6*(1), 67–73. https://doi.org/10.2190/YX88-MJKY-X196-N185

*Gold, S. R., & Minor, S. W. (1983). School related daydreams and test anxiety. *Imagination, Cognition and Personality*, *3*(2), 133–138. https://doi.org/10.2190/D3K1-5H48-1KV3-KUL7

*Golding, J. M., & Singer, J. L. (1983). Patterns of inner experience: Daydreaming styles, depressive moods, and sex roles. *Journal of Personality and Social Psychology*, *45*(3), 663–675. https://doi.org/10.1037/0022-3514.45.3.663

Gross, J. J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, *26*(1), 1–26. https://doi.org/10.1080/1047840X.2014.940781

Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clinical Psychology Review*, *37*, 1–12. https://doi.org/10.1016/j.cpr.2015.01.006

*Guesdon, A., Lejeune, F. X., Rotgé, J. Y., George, N., & Fossati, P. (2020). Mind-wandering changes in dysphoria. *Frontiers in Psychiatry*, *11*, Article 544999. https://doi.org/10.3389/fpsyt.2020.544999

Harrer, M., Cuijpers, P., & Ebert, D. D. (2019). *Doing meta-analysis in R: A hands-on guide* (1st ed.). Chapman and Hall/CRC.

*He, H., Chen, Q., Wei, D., Shi, L., & Qiu, J. (2019). Thought control ability moderates the effect of mind wandering on positive affect via the frontoparietal control network. *Frontiers in Psychology*, *9*, Article 2791. https://doi.org/10.3389/fpsyg.2018.02791

*He, H., Hu, L., Li, H., Cao, Y., & Zhang, X. (2021). The influence of mood on the effort in trying to shift one's attention from a mind wandering phase to focusing on ongoing activities in a laboratory and in daily life. *Cognition and Emotion*, *35*(6), 1136–1149. https://doi.org/10.1080/02699931.2021.1929854

Headey, B., Holmström, E., & Wearing, A. (1984). Well-being and ill-being: Different dimensions? *Social Indicators Research*, *14*(2), 115–139. https://doi.org/10.1007/BF00293406

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, *33*(2–3), 61–83. https://doi.org/10.1017/S0140525X0999152X

*Hobbiss, M. H., Fairnie, J., Jafari, K., & Lavie, N. (2019). Attention, mindwandering, and mood. *Consciousness and Cognition*, *72*, 1–18. https://doi.org/10.1016/j.concog.2019.04.007

*Hoffmann, F., Banzhaf, C., Kanske, P., Bermpohl, F., & Singer, T. (2016). Where the depressed mind wanders: Self-generated thought patterns as assessed through experience sampling as a state marker of depression. *Journal of Affective Disorders*, *198*, 127–134. https://doi.org/10.1016/j.jad.2016.03.005

Hojat, M., & Xu, G. A. (2004). A visitor's guide to effect sizes: Statistical significance versus practical (clinical) importance of research findings. *Advances in Health Sciences Education*, *9*(3), 241–249. https://doi.org/10.1023/B:AHSE.0000038173.00909.f6

Howell, R. T., & Howell, C. J. (2008). The relation of economic status to subjective well-being in developing countries: A meta-analysis. *Psychological Bulletin*, *134*(4), 536–560. https://doi.org/10.1037/0033-2909.134.4.536

Hutt, S., Hardey, J., Bixler, R., Steward, A., Risko, E., & D'Mello, S. K. (2017, June 25). *Gaze-based detection of mind wandering during lecture viewing* [Conference session]. International Educational Data Mining Society, Raleigh, United States. https://files.eric.ed.gov/fulltext/ED596576.pdf

Irving, Z. C. (2021). Drifting and directed minds: The significance of mind-wandering for mental agency. *The Journal of Philosophy*, *118*(11), 614–644. https://doi.org/10.5840/jphil20211181141

*Ji, J. L., Holmes, E. A., MacLeod, C., & Murphy, F. C. (2019). Spontaneous cognition in dysphoria: Reduced positive bias in imagining the future. *Psychological Research*, *83*(4), 817–831. https://doi.org/10.1007/s00426-018-1071-y

*Ji, J. L., Murphy, F. C., Grafton, B., MacLeod, C., & Holmes, E. A. (2022). Emotional mental imagery generation during spontaneous future thinking: Relationship with optimism and negative mood. *Psychological Research*, *86*(2), 617–626. https://doi.org/10.1007/s00426-021-01501-w

*Johannes, N., Veling, H., Dora, J., Meier, A., Reinecke, L., & Buijzen, M. (2018). Mind-wandering and mindfulness as mediators of the relationship between online vigilance and well-being. *Cyberpsychology, Behavior, and Social Networking*, *21*(12), 761–767. https://doi.org/10.1089/cyber.2018.0373

Kam, J. W. Y., Irving, Z. C., Mills, C., Patel, S., Gopnik, A., & Knight, R. T. (2021). Distinct electrophysiological signatures of task-unrelated and dynamic thoughts. *Proceedings of the National Academy of Sciences of the United States of America*, *118*(4), Article e2011796118. https://doi.org/10.1073/pnas.2011796118

Kam, J. W. Y., Rahnuma, T., Park, Y. E., & Hart, C. M. (2022). Electrophysiological markers of mind wandering: A systematic review. *NeuroImage*, *258*, Article 119372. https://doi.org/10.1016/j.neuroimage.2022.119372

Kam, J. W. Y., Wong, A. Y., Thiemann, R. F., Hasan, F., Andrews-Hanna, J. R., & Mills, C. (2023, November 22). *On the relationship between unprompted thought and affective well-being: A systematic review and meta-analysis*. https://osf.io/yrhmg/

Kane, M. J., Brown, L. H., McVay, J. C., Silvia, P. J., Myin-Germeys, I., & Kwapil, T. R. (2007). For whom the mind wanders, and when: An experience-sampling study of working memory and executive control in daily life. *Psychological Science*, *18*(7), 614–621. https://doi.org/10.1111/j.1467-9280.2007.01948.x

*Killingsworth, M. A., & Gilbert, D. T. (2010). A wandering mind is an unhappy mind. *Science*, *330*(6006), Article 932. https://doi.org/10.1126/science.1192439

Kircanski, K., Thompson, R. J., Sorenson, J., Sherdell, L., & Gotlib, I. H. (2018). The everyday dynamics of rumination and worry: Precipitant events and affective consequences. *Cognition and Emotion*, *32*(7), 1424–1436. https://doi.org/10.1080/02699931.2017.1278679

Klinger, E. (1987). Current concerns and disengagement from incentives. In F. Halisch & J. Kuhl (Eds.), *Motivation, intention, and volition* (pp. 337–347). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-70967-8_23

Klinger, E. (2013). Goal Commitments and the content of thoughts and dreams: Basic principles. *Frontiers in Psychology*, *4*, Article 415. https://doi.org/10.3389/fpsyg.2013.00415

Klinger, E., & Cox, W. M. (2011). Motivation and the goal theory of current concerns. In W. M. Cox & E. Klinger (Eds.), *Handbook of motivational counseling* (pp. 3–47). Wiley. https://doi.org/10.1002/9780470979952.ch1

Kmet, L. M., Lee, R. C., & Cook, L. S. 2004. *Standard quality assessment criteria for evaluating primary research papers from a variety of fields*. Alberta Heritage Foundation for Medical Research.

Konu, D., Mckeown, B., Turnbull, A., Ho, N. S. P., Karapanagiotidis, T., Vanderwal, T., McCall, C., Tipper, S. P., Jefferies, E., & Smallwood, J. (2021). Exploring patterns of ongoing thought under naturalistic and conventional task-based conditions. *Consciousness Cognition*, *93*, Article 103139. https://doi.org/10.1016/j.concog.2021.103139

*Krimsky, M. (2018). *The allocation of attentional resources: Exploring fluctuations in mind wandering with variation in performance and affective variables*. [Doctoral dissertation, University of Miami]. ProQuest Dissertations Publishing.

*Kruger, T. B., Dixon, M. J., Graydon, C., Larche, C. J., Stange, M., Smith, S. D., & Smilek, D. (2022). Contrasting mind-wandering, (dark) flow, and affect during multiline and single-line slot machine play. *Journal of Gambling Studies*, *38*(1), 185–203. https://doi.org/10.1007/s10899-021-10027-0

*Kruger, T. B., Dixon, M. J., Graydon, C., Stange, M., Larche, C. J., Smith, S. D., & Smilek, D. (2020). Using deliberate mind-wandering to escape negative mood states: Implications for gambling to escape. *Journal of Behavioral Addictions*, *9*(3), 723–733. https://doi.org/10.1556/2006.2020.00067

*Kuehner, C., Welz, A., Reinhard, I., & Alpers, G. W. (2017). Lab meets real life: A laboratory assessment of spontaneous thought and its ecological validity. *PLOS ONE*, *12*(9), Article e0184488. https://doi.org/10.1371/journal.pone.0184488

Lachman, M. E., & Weaver, S. L. (1998). The sense of control as a moderator of social class differences in health and well-being. *Journal of Personality and Social Psychology*, *74*(3), 763–773. https://doi.org/10.1037/0022-3514.74.3.763

Lanier, J., Noyes, E., & Biederman, J. (2021). Mind wandering (internal distractibility) in ADHD: A literature review. *Journal of Attention Disorders*, *25*(6), 885–890. https://doi.org/10.1177/1087054719865781

*Linz, R., Pauly, R., Smallwood, J., & Engert, V. (2021). Mind-wandering content differentially translates from lab to daily life and relates to subjective stress experience. *Psychological Research*, *85*(2), 649–659. https://doi.org/10.1007/s00426-019-01275-2

*Lupien, S. J., Leclaire, S., Majeur, D., Raymond, C., Jean Baptiste, F., & Giguère, C.-E. (2022). 'Doctor, I am so stressed out!' A descriptive study of biological, psychological, and socioemotional markers of stress in individuals who self-identify as being 'very stressed out' or 'zen'. *Neurobiology of Stress*, *18*, Article 100454. https://doi.org/10.1016/j.ynstr.2022.100454

Magan, S. J. (1985). *The relationships among subjective well-being, life change, and daydream styles in adult males* [Doctoral dissertation, Newyork University]. Proquest Dissertations Publishing.

*Maillet, D., Beaty, R. E., Jordano, M. L., Touron, D. R., Adnan, A., Silvia, P. J., Kwapil, T. R., Turner, G. R., Spreng, R. N., & Kane, M. J. (2018). Age-related differences in mind-wandering in daily life. *Psychology and Aging*, *33*(4), 643–653. https://doi.org/10.1037/pag0000260

*Mar, R. A., Mason, M. F., & Litvack, A. (2012). How daydreaming relates to life satisfaction, loneliness, and social support: The importance of gender and daydream content. *Consciousness and Cognition*, *21*(1), 401–407. https://doi.org/10.1016/j.concog.2011.08.001

*Marchetti, I., Koster, E. H. W., & De Raedt, R. (2012). Mindwandering heightens the accessibility of negative relative to positive thought. *Consciousness and Cognition*, *21*(3), 1517–1525. https://doi.org/10.1016/j.concog.2012.05.013

*Marchetti, I., Van de Putte, E., & Koster, E. H. W. (2014). Self-generated thoughts and depression: From daydreaming to depressive symptoms. *Frontiers in Human Neuroscience*, *8*, Article 131. https://doi.org/10.3389/fnhum.2014.00131

*Martinon, L. M., Smallwood, J., Hamilton, C., & Riby, L. M. (2019). Frogs' legs versus roast beef: How culture can influence mind-wandering episodes across the lifespan. *Europe's Journal of Psychology*, *15*(2), 211–239. https://doi.org/10.5964/ejop.v15i2.1597

Mckeown, B., Poerio, G. L., Strawson, W. H., Martinon, L. M., Riby, L. M., Jefferies, E., McCall, C., & Smallwood, J. (2021). The impact of social isolation and changes in work patterns on ongoing thought during the first COVID-19 lockdown in the United Kingdom. *Proceedings of the National Academy of Sciences of the United States of America*, *118*(40), Article e2102565118. https://doi.org/10.1073/pnas.2102565118

McMillan, R. L., Kaufman, S. B., & Singer, J. L. (2013). Ode to positive constructive daydreaming. *Frontiers in Psychology*, *4*, Article 626. https://doi.org/10.3389/fpsyg.2013.00626

McVay, J. C., Kane, M. J., & Kwapil, T. R. (2009). Tracking the train of thought from the laboratory into everyday life: An experience-sampling study of mind wandering across controlled and ecological contexts. *Psychonomic Bulletin & Review*, *16*(5), 857–863. https://doi.org/10.3758/PBR.16.5.857

*Meyer, T. D., Finucane, L., & Jordan, G. (2011). Is risk for mania associated with increased daydreaming as a form of mental imagery? *Journal of Affective Disorders*, *135*(1–3), 380–383. https://doi.org/10.1016/j.jad.2011.06.002

Mills, C., Bixler, R., Wang, X., & D'mello, S. K. (2016). *Automatic gaze-based detection of mind wandering during narrative film comprehension*. International Educational Data Mining Society.

Mills, C., Gregg, J., Bixler, R., & D'Mello, S. K. (2021). Eye-mind reader: An intelligent reading interface that promotes long-term comprehension by detecting and responding to mind wandering. *Human–Computer Interaction*, *36*(4), 306–332. https://doi.org/10.1080/07370024.2020.1716762

*Mills, C., Porter, A. R., Andrews-Hanna, J. R., Christoff, K., & Colby, A. (2021). How task-unrelated and freely moving thought relate to affect: Evidence for dissociable patterns in everyday life. *Emotion*, *21*(5), 1029–1040. https://doi.org/10.1037/emo0000849

Mills, C., Raffaelli, Q., Irving, Z. C., Stan, D., & Christoff, K. (2018). Is an off-task mind a freely-moving mind? Examining the relationship between different dimensions of thought. *Consciousness and Cognition*, *58*, 20–33. https://doi.org/10.1016/j.concog.2017.10.003

*Miś, M., & Kowalczyk, M. (2021). Mind-wandering during long-distance running and mood change. The role of working memory capacity and temporal orientation of thoughts. *International Journal of Sport and Exercise Psychology*, *19*(5), 815–833. https://doi.org/10.1080/1612197X.2020.1766538

Moberly, N. J., & Watkins, E. R. (2008). Ruminative self-focus and negative affect: An experience sampling study. *Journal of Abnormal Psychology*, *117*(2), 314–323. https://doi.org/10.1037/0021-843X.117.2.314

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Prisma Group. (2010). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *International Journal of Surgery*, *8*(5), 336–341. https://doi.org/10.1016/j.ijsu.2010.02.007

*Murphy, F., Macpherson, K., Jeyabalasingham, T., Manly, T., & Dunn, B. (2013). Modulating mind-wandering in dysphoria. *Frontiers in Psychology*, *4*, Article 888. https://doi.org/10.3389/fpsyg.2013.00888

Murray, S., Krasich, K., Schooler, J. W., & Seli, P. (2020). What's in a task? Complications in the study of the task-unrelated-thought variety of mind wandering. *Perspectives on Psychological Science*, *15*(3), 572–588. https://doi.org/10.1177/1745691619897966

*Musetti, A., Franceschini, C., Pingani, L., Freda, M. F., Saita, E., Vegni, E., Zenesini, C., Quattropani, M. C., Lenzo, V., Margherita, G., Lemmo, D., Corsano, P., Borghi, L., Cattivelli, R., Plazzi, G., Castelnuovo, G., Somer, E., & Schimmenti, A. (2021). Maladaptive daydreaming in an adult Italian

population during the COVID-19 lockdown. *Frontiers in Psychology*, *12*, Article 631979. https://doi.org/10.3389/fpsyg.2021.631979

*Musetti, A., Soffer-Dudek, N., Imperato, C., Schimmenti, A., & Franceschini, C. (2023). Longitudinal associations between maladaptive daydreaming and psychological distress during the COVID-19 health crisis. *Journal of Behavioral Addictions*, *12*(1), 288–294. https://doi.org/10.1556/2006.2023.00001

*Nyklíček, I., Tinga, A. M., & Spapens, S. (2021). The relation between thinking and mood in daily life: The effects of content and context of thought. *Consciousness and Cognition*, *95*, Article 103193. https://doi.org/10.1016/j.concog.2021.103193

*Ottaviani, C., Medea, B., Lonigro, A., Tarvainen, M., & Couyoumdjian, A. (2015). Cognitive rigidity is mirrored by autonomic inflexibility in daily life perseverative cognition. *Biological Psychology*, *107*, 24–30. https://doi.org/10.1016/j.biopsycho.2015.02.011

*Pereira, E. J., Gurguryan, L., & Ristic, J. (2020). Trait-level variability in attention modulates mind wandering and academic achievement. *Frontiers in Psychology*, *11*, Article 909. https://doi.org/10.3389/fpsyg.2020.00909

Peterson, R. A., & Brown, S. P. (2005). On the use of beta coefficients in meta-analysis. *Journal of Applied Psychology*, *90*(1), 175–181. https://doi.org/10.1037/0021-9010.90.1.175

*Poerio, G. L., Totterdell, P., Emerson, L.-M., & Miles, E. (2015). Love is the triumph of the imagination: Daydreams about significant others are associated with increased happiness, love and connection. *Consciousness and Cognition*, *33*, 135–144. https://doi.org/10.1016/j.concog.2014.12.011

*Poerio, G. L., Totterdell, P., & Miles, E. (2013). Mind-wandering and negative mood: Does one thing really lead to another? *Consciousness and Cognition*, *22*(4), 1412–1421. https://doi.org/10.1016/j.concog.2013.09.012

Raffaelli, Q., Mills, C., de Stefano, N.-A., Mehl, M. R., Chambers, K., Fitzgerald, S. A., Wilcox, R., Christoff, K., Andrews, E. S., Grilli, M. D., O'Connor, M.-F., & Andrews-Hanna, J. R. (2021). The think aloud paradigm reveals differences in the content, dynamics and conceptual scope of resting state thought in trait brooding. *Scientific Reports*, *11*(1), Article 19362. https://doi.org/10.1038/s41598-021-98138-x

Randall, J. G., Oswald, F. L., & Beier, M. E. (2014). Mind-wandering, cognition, and performance: A theory-driven meta-analysis of attention regulation. *Psychological Bulletin*, *140*(6), 1411–1431. https://doi.org/10.1037/a0037428

R Core Team. (2022). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. https://www.R-project.org/.

Rodgers, M. A., & Pustejovsky, J. E. (2021). Evaluating meta-analytic methods to detect selective reporting in the presence of dependent effect sizes. *Psychological Methods*, *26*(2), 141–160. https://doi.org/10.1037/met0000300

*Rostami, S., Borjali, A., Eskandari, H., Rostami, R., Scalabrini, A., & Northoff, G. (2022). Slow and powerless thought dynamic relates to brooding in unipolar and bipolar depression. *Psychopathology*, *55*(5), 258–272. https://doi.org/10.1159/000523944

*Ruby, F. J. M., Smallwood, J., Engen, H., & Singer, T. (2013). How self-generated thought shapes mood—The relation between mind-wandering and mood depends on the socio-temporal content of thoughts. *PLOS ONE*, *8*(10), Article e77554. https://doi.org/10.1371/journal.pone.0077554

Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review*, *110*(1), 145–172. https://doi.org/10.1037/0033-295X.110.1.145

Ryff, C. D., Dienberg Love, G., Urry, H. L., Muller, D., Rosenkranz, M. A., Friedman, E. M., Davidson, R. J., & Singer, B. (2006). Psychological well-being and ill-being: Do they have distinct or mirrored biological correlates? *Psychotherapy and Psychosomatics*, *75*(2), 85–95. https://doi.org/10.1159/000090892

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*(7), 319–326. https://doi.org/10.1016/j.tics.2011.05.006

*Seli, P., Beaty, R. E., Marty-Dugas, J., & Smilek, D. (2019). Depression, anxiety, and stress and the distinction between intentional and unintentional mind wandering. *Psychology of Consciousness: Theory, Research, and Practice*, *6*(2), 163–170. https://doi.org/10.1037/cns0000182

Seli, P., Kane, M. J., Smallwood, J., Schacter, D. L., Maillet, D., Schooler, J. W., & Smilek, D. (2018). Mind-wandering as a natural kind: A family-resemblances view. *Trends in Cognitive Sciences*, *22*(6), 479–490. https://doi.org/10.1016/j.tics.2018.03.010

Seli, P., Risko, E. F., & Smilek, D. (2016). Assessing the associations among trait and state levels of deliberate and spontaneous mind wandering. *Consciousness and Cognition*, *41*, 50–56. https://doi.org/10.1016/j.concog.2016.02.002

Seli, P., Smallwood, J., Cheyne, J. A., & Smilek, D. (2015). On the relation of mind wandering and ADHD symptomatology. *Psychonomic Bulletin & Review*, *22*(3), 629–636. https://doi.org/10.3758/s13423-014-0793-0

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological momentary assessment. *Annual Review of Clinical Psychology*, *4*, 1–32. https://doi.org/10.1146/annurev.clinpsy.3.022806.091415

*Sikka, P., Valli, K., Revonsuo, A., & Tuominen, J. (2021). The dynamics of affect across the wake-sleep cycle: From waking mind-wandering to nighttime dreaming. *Consciousness and Cognition*, *94*, Article 103189. https://doi.org/10.1016/j.concog.2021.103189

Singer, J. L. (1966). *Daydreaming: An introduction to the experimental study of inner experience*. Random House.

Singer, J. L. (1975). Navigating the stream of consciousness: Research in daydreaming and related inner experience. *American Psychologist*, *30*(7), 727–738. https://doi.org/10.1037/h0076928

Singer, J. L., & Antrobus, J. S. (1963). A factor-analytic study of daydreaming and conceptually-related cognitive and personality variables. *Perceptual and Motor Skills*, *17*(1), 187–209. https://doi.org/10.2466/pms.1963.17.1.187

*Singer, J. L., & Rowe, R. (1962). An experimental study of some relationships between daydreaming and anxiety. *Journal of Consulting Psychology*, *26*(5), 446–454. https://doi.org/10.1037/h0047094

Smallwood, J. (2013). Distinguishing how from why the mind wanders: A process-occurrence framework for self-generated mental activity. *Psychological Bulletin*, *139*(3), 519–535. https://doi.org/10.1037/a0030010

Smallwood, J., & Andrews-Hanna, J. (2013). Not all minds that wander are lost: The importance of a balanced perspective on the mind-wandering state. *Frontiers in Psychology*, *4*, Article 441. https://doi.org/10.3389/fpsyg.2013.00441

*Smallwood, J., O'Connor, R. C., & Heim, D. (2005). Rumination, dysphoria, and subjective experience. *Imagination, Cognition and Personality*, *24*(4), 355–367. https://doi.org/10.2190/AE18-AD1V-YF7L-EKBX

Smallwood, J., & Schooler, J. W. (2006). The restless mind. *Psychological Bulletin*, *132*(6), 946–958. https://doi.org/10.1037/0033-2909.132.6.946

*Soffer-Dudek, N., & Somer, E. (2018). Trapped in a daydream: Daily elevations in maladaptive daydreaming are associated with daily psychopathological symptoms. *Frontiers in Psychiatry*, *9*, Article 194. https://doi.org/10.3389/fpsyt.2018.00194

Somer, E., Lehrfeld, J., Bigelsen, J., & Jopp, D. S. (2016). Development and validation of the Maladaptive Daydreaming Scale (MDS). *Consciousness and Cognition*, *39*, 77–91. https://doi.org/10.1016/j.concog.2015.12.001

Southwick, F. S., & Southwick, S. M. (2018). The loss of a sense of control as a major contributor to physician burnout: A neuropsychiatric pathway

to prevention and recovery. *JAMA Psychiatry*, *75*(7), 665–666. https://doi.org/10.1001/jamapsychiatry.2018.0566

*Spronken, M., Holland, R. W., Figner, B., & Dijksterhuis, A. (2016). Temporal focus, temporal distance, and mind-wandering valence: Results from an experience sampling and an experimental study. *Consciousness and Cognition*, *41*, 104–118. https://doi.org/10.1016/j.concog.2016.02.004

Sripada, C., & Taxali, A. (2020). Structure in the stream of consciousness: Evidence from a verbalized thought protocol and automated text analytic methods. *Consciousness and Cognition*, *85*, Article 103007. https://doi.org/10.1016/j.concog.2020.103007

*Stawarczyk, D., Majerus, S., Van der Linden, M., & D'Argembeau, A. (2012). Using the daydreaming frequency scale to investigate the relationships between mind-wandering, psychological well-being, and present-moment awareness. *Frontiers in Psychology*, *3*, Article 363. https://doi.org/10.3389/fpsyg.2012.00363

*Sugiura, Y., & Sugiura, T. (2020). Relation between daydreaming and well-being: Moderating effects of otaku contents and mindfulness. *Journal of Happiness Studies*, *21*, 1199–1223. https://doi.org/10.1007/s10902-019-00123-9

Teasdale, J. D. (1983). Negative thinking in depression: Cause, effect, or reciprocal relationship? *Advances in Behaviour Research and Therapy*, *5*(1), 3–25. https://doi.org/10.1016/0146-6402(83)90013-9

Thiemann, R. F., Mills, C., & Kam, J. W. Y. (2023). Differential relationships between thought dimensions and momentary affect in daily life. *Psychological Research*, *87*(5), 1632–1643. https://doi.org/10.1007/s00426-022-01766-9

*Tudino, R. F., Mowry, N. L., & Jellison, W. A. (2020). Does life satisfaction mediate the relationship between mood and daydreaming frequency? *Psi Chi Journal of Psychological Research*, *25*(2), 90–97. https://doi.org/10.24839/2325-7342.JN25.2.90

Turnbull, A., Wang, H. T., Murphy, C., Ho, N. S. P., Wang, X., Sormaz, M., Karapanagiotidis, T., Leech, R. M., Bernhardt, B., Margulies, D. S., Vatansever, D., Jefferies, E., & Smallwood, J. (2019). Left dorsolateral prefrontal cortex supports context-dependent prioritisation of off-task thought. *Nature Communications*, *10*(1), Article 3816. https://doi.org/10.1038/s41467-019-11764-y

Van den Noortgate, W., López-López, J. A., Marín-Martínez, F., & Sánchez-Meca, J. (2013). Three-level meta-analysis of dependent effect sizes. *Behavior Research Methods*, *45*(2), 576–594. https://doi.org/10.3758/s13428-012-0261-6

*Vannikov-Lugassi, M., & Soffer-Dudek, N. (2018). No time like the present: Thinking about the past and the future is related to state dissociation among individuals with high levels of psychopathological symptoms. *Frontiers in Psychology*, *9*, Article 2465. https://doi.org/10.3389/fpsyg.2018.02465

Vatansever, D., Karapanagiotidis, T., Margulies, D. S., Jefferies, E., & Smallwood, J. (2020). Distinct patterns of thought mediate the link between brain functional connectomes and well-being. *Network Neuroscience*, *4*(3), 637–657. https://doi.org/10.1162/netn_a_00137

Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor Package. *Journal of Statistical Software*, *36*(3), 1–48. https://doi.org/10.18637/jss.v036.i03

*Vinski, M. T., & Watter, S. (2013). Being a grump only makes things worse: A transactional account of acute stress on mind wandering. *Frontiers in Psychology*, *4*, Article 730. https://doi.org/10.3389/fpsyg.2013.00730

*Walker, H. E. K., & Trick, L. M. (2018). Mind-wandering while driving: The impact of fatigue, task length, and sustained attention abilities. *Transportation Research Part F: Traffic Psychology and Behaviour*, *59*, 81–97. https://doi.org/10.1016/j.trf.2018.08.009

Wang, H. T., Poerio, G., Murphy, C., Bzdok, D., Jefferies, E., & Smallwood, J. (2018). Dimensions of experience: Exploring the heterogeneity of the wandering mind. *Psychological Science*, *29*(1), 56–71. https://doi.org/10.1177/0956797617728727

*Welz, A., Reinhard, I., Alpers, G. W., & Kuehner, C. (2018). Happy thoughts: Mind wandering affects mood in daily life. *Mindfulness*, *9*(1), 332–343. https://doi.org/10.1007/s12671-017-0778-y

Whiting, P. F., Rutjes, A. W., Westwood, M. E., Mallett, S., Deeks, J. J., Reitsma, J. B., Leeflang, M. M., Sterne, J. A., Bossuyt, P. M., & the QUADAS-2 Group. (2011). QUADAS-2: A revised tool for the quality assessment of diagnostic accuracy studies. *Annals of Internal Medicine*, *155*(8), 529–536. https://doi.org/10.7326/0003-4819-155-8-201110180-00009

*Yip, J. M., Jodoin, N. M., & Handy, T. C. (2023). Dimensions of inattention: Cognitive, behavioral, and affective consequences. *Frontiers in Psychology*, *14*, Article 1075953. https://doi.org/10.3389/fpsyg.2023.1075953

Zedelius, C. M., Protzko, J., Broadway, J. M., & Schooler, J. W. (2021). What types of daydreaming predict creativity? Laboratory and experience sampling evidence. *Psychology of Aesthetics, Creativity, and the Arts*, *15*(4), 596–611. https://doi.org/10.1037/aca0000342

Zedelius, C. M., & Schooler, J. W. (2015). Mind wandering "Ahas" versus mindful reasoning: Alternative routes to creative solutions. *Frontiers in Psychology*, *6*, Article 834. https://doi.org/10.3389/fpsyg.2015.00834

*Zeitlen, D. C., Silvia, P. J., Kane, M. J., & Beaty, R. E. (2022). The creative mind in daily life: How cognitive and affective experiences relate to creative thinking and behavior. *Psychology of Aesthetics, Creativity, and the Arts*. Advance online publication. https://doi.org/10.1037/aca0000537

Received July 5, 2022
Revision received November 27, 2023
Accepted January 9, 2024 ■