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Depression, Anxiety, and Stress and the Distinction Between Intentional and Unintentional Mind Wandering

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We examined whether the previously documented association between mind wandering and affective dysfunction depends, at least to some extent, on whether mind wandering episodes are intentional or unintentional. In two large samples, we assessed trait-level rates of intentional and unintentional mind wandering, as well as three different types of affective dysfunction: depression, anxiety, and stress. Results indicated that, whereas unintentional mind wandering was uniquely positively associated with all three types of affective dysfunction, intentional mind wandering was uniquely (albeit very weakly) negatively associated with stress and anxiety and had no relation to depression. These findings indicate that people who more frequently engage in unintentional types of mind wandering are more likely to report symptoms of depression, anxiety, and stress, and that intentional mind wandering may buffer against these types of affective dysfunction.

Keywords: mind wandering, depression, anxiety, stress, DASS

Over the past several years, there has been a growing interest in the relation between mind wandering (broadly defined as task-unrelated thought, stimulus-independent thought, and so forth) and affective states. Research on this topic has revealed that people who tend to mind wander more frequently also tend to experience increased negative affect and lower psychological well-being (e.g., Deng, Li, & Tang, 2014; Killingsworth & Gilbert, 2010; Mason, Brown, Mar, & Smallwood, 2013; Smallwood, Fitzgerald, Miles, & Phillips, 2009; but see Ottaviani, Medea, Lonigro, Tarvainen, & Couyoumdjian, 2015, and Ottaviani, Shapiro, & Couyoumdjian, 2013). For instance, one common finding is that people with depressive symptomatology are more likely to exhibit increased rates of mind wandering compared to their less depressed counterparts (e.g., Deng et al., 2014). Relatedly, research has shown that people tend to report lower levels of happiness while engaged in bouts of mind wandering (Killingsworth & Gilbert, 2010), which has led some to conclude that "a wandering mind is an unhappy mind" (Killingsworth & Gilbert, 2010, p. 932). Given the ubiquitous nature of mind wandering (Kane et al., 2007; Killingsworth & Gilbert, 2010; Seli et al., 2018), such conclusions are, of course, rather concerning.

In considering the link between mind wandering and affective dysfunction, one important factor that has not yet been considered is the intentionality of the mind wandering episodes under investigation; that is, whether mind wandering episodes were engaged with or without intention (for a review on the intentionality of mind wandering, see Seli, Risko,

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Smilek, & Schacter, 2016). Given that intentional and unintentional types of mind wandering have been shown to differentially associate with certain theoretically important variables (e.g., attention-deficit/hyperactivity disorder and obsessive–compulsive disorder symptomatology; Seli, Smallwood, Cheyne, & Smilek, 2015; Seli, Risko, Purdon, & Smilek, 2017, respectively), it is possible that the link between mind wandering and affective dysfunction may depend on the intentionality of episodes of mind wandering. Here, we sought to expand upon previous work linking mind wandering to affective dysfunction by distinguishing between intentional and unintentional types of mind wandering and determining whether these types differentially relate to specific types of affective dysregulation, including depression, anxiety, and stress.

What might be the relation between the intentionality of mind wandering episodes and affective dysregulation? One answer to this question emerges from consideration of variables that are known to be related to both mind wandering and affective dysfunction. Specifically, research has shown that, whereas unintentional mind wandering is uniquely positively associated with attention failures, intentional mind wandering shares no such relation with attention failures (Carriere, Seli, & Smilek, 2013). In addition, attention failures have been shown to positively correlate with symptoms of depression, anxiety, and stress (e.g., Carriere, Cheyne, & Smilek, 2008; Mahoney, Dalby, & King, 1998). Given the aforementioned associations, one possibility is that unintentional, but not intentional, mind wandering may be positively associated with depression, anxiety, and stress.

Studies of the neurophysiological basis of mood disorders and attention failures provide further support for the hypothesis that depression, anxiety, and stress might be linked to unintentional (but not intentional) bouts of mind wandering. Indeed, it is well known that chronic exposure to stressors leads to persistently high levels of circulating cortisol (released via the hypothalamic–pituitary–adrenal axis; see Miller, Chen, & Zhou, 2007), which enters the brain and, at such high levels, causes damage to several brain areas, including the prefrontal cortex and the hippocampus (Popoli, Yan, McEwen, & Sanacora, 2011). This damage is further exacerbated by stress-related increases in inflammation (Black, 2002; Raison, Capuron, & Miller, 2006). Critically, this chronic stress-related damage to various areas of the brain has been associated with mood disorders (see Frodl & O'Keane, 2013; Miller, Maletic, & Raison, 2009) and impaired attentional control (Liston, McEwen, & Casey, 2009). Thus, at a physiological level, stress, mood disorders, and impaired attentional control are related. Accordingly, it seems reasonable to speculate that depression, anxiety, and stress might all be related specifically to unintentional mind wandering, which is characterized by a failure of control. It is also worth noting that increases in negatively valenced mind wandering (which is often assumed to be unintentional in nature) have been linked to higher levels of circulating cortisol (Engert, Smallwood, & Singer, 2014), which further supports a link between mind wandering and the physiological stress response.

To explore the possibility that symptoms of depression, anxiety, and stress are associated with unintentional (but not intentional) mind wandering, in the present study, across two large independent samples (Sample 1: $N = 2{,}581$; Sample 2: $N = 2{,}107$), we assessed trait levels of intentional and unintentional mind wandering, as well as trait levels of depression, anxiety, and stress (obtained via the 21-item Depression Anxiety Stress Scale [DASS-21]; Antony, Bieling, Cox, Enns, & Swinson, 1998). Whereas participants in Sample 1 completed our study in 2013, those in Sample 2 completed it in 2017.

Method

We report how we determined our sample size, all data exclusions, and all measures obtained in our two studies. In accordance with the recommendations of Seli, Kane, et al. (2018), we specify that, because the trait-level questionnaires used to assess mind wandering in the present study did not isolate any particular variety (or varieties) of mind wandering, our conceptualization (and operationalization) of mind wandering was broadly conceived. For instance, task-unrelated thought, unconstrained/dynamic thought, and stimulus-independent thought could all qualify as "mind wandering" according to the questionnaires used in our study. This is a topic to which we return in the Discussion.

Participants

To allow for replication of our findings, we analyzed data from two separate nonclinical samples of undergraduate psychology students. For both samples, we collected data from as many undergraduate students who were willing to complete our online questionnaires within the first two months of classes. All participants provided informed consent and were treated in accordance with the guidelines approved by institutional review board committee. The first sample consisted of 2,581 participants (M_{age} = 20.20, SD = 3.82, range = 15–58; 1,821 females, 754 males)[1] and the second sample consisted of 2,107 participants (M_{age} = 20.54, SD = 3.21, range = 19.5–47[2]; 1,567 females, 526 males, and 14 participants who selected "other gender").[3] Also included among the scales of interest (i.e., Mind Wandering–Spontaneous [MW-S], Mind Wandering–Deliberate [MW-D], and the DASS-21) were numerous other online questionnaires that were of interest to other researchers but that were not analyzed in the present study. All questionnaires were given to participants prior to the end of the second month of classes, and the order of presentation was randomized across participants. Thus, participants were unaware of the relatedness of our scales. Participants received partial course credit for completing the questionnaires. Across both samples, we excluded all data from any participants who failed to complete every item of the questionnaires of interest (i.e., the MW-D, MW-S, and DASS-21); this resulted in the removal of data from 127 participants in Sample 1 and 88 participants in Sample 2.

Measures

Deliberate and spontaneous mind wandering. We used the four-item MW-D scale and the four-item MW-S scale to index intentional and unintentional mind wandering, respectively (Carriere et al., 2013). The MW-D includes items related to intentional mind wandering, such as: "I allow my thoughts to wander on purpose," whereas the MW-S includes items related to unintentional mind wandering, such as: "I find my thoughts wandering spontaneously." Both scales are scored using a seven-point Likert scale.

Depression, Anxiety, Stress Scale (DASS-21). We used the 21-item Depression, Anxiety and Stress Scale (Antony et al., 1998) to index symptoms of depression, stress, and anxiety over the prior week. The DASS can be divided into three subscales to index unique features of depression, anxiety, and stress. For example, the depression subscale includes items such as "I felt that life was meaningless" that indicate low positive affect, while the anxiety subscale includes items such as "I felt scared without any good reason" that indicate hyperarousal. The stress subscale includes items such as "I found it hard to wind down" that are thought to indicate tension. Each subscale includes seven items and is answered on a 4-point Likert scale, with higher responses indicating higher levels of symptomatology.

Results

All data have been made publicly available via Open Science Framework and can be accessed at https://osf.io/zns89/.

Descriptive Statistics and Correlations

We began by examining the descriptive statistics for the MW-D, MW-S, and the three facets of the DASS-21 (Depression, Anxiety, and Stress) in each of our two samples. As can be seen in Table 1, mean scores on the MW-D, MW-S, and the three facets of the DASS-21 all showed a high level of consistency and reliability across both samples. Moreover, in examining the psychometric properties of our primary measures, we found that, in both samples, skewness and kurtosis values were within acceptable ranges (skewness <2, kurtosis <4; Kline, 1998).

Next, we examined the Pearson product–moment correlation coefficients for all measures (see Table 2). Following the advice of a reviewer, we also computed the disattenuated correlations, which are useful because they "rid a correlation coefficient from the weakening effect of measure-

[1] Six participants did not provide their gender, and 88 participants did not provide their age.

[2] "Birth year," but not age, was provided for this sample, and 1,621 participants indicated they were born in "1996 or later." All these participants were coded as being 19.5 years old (the mean of ages 18–21).

[3] Twenty-two participants did not provide their age.

Table 1
Descriptive Statistics for Primary Measures for Sample 1 (N = 2,581) and Sample 2 (N = 2,107)

Sample	*M*	Range	*SD*	α	Skewness	Kurtosis
Sample 1[a]						
MW-D	4.50	1–7	1.44	.88	–.30	–.43
MW-S	4.28	1–7	1.43	.88	–.23	–.37
Depression	1.73	1–4	.69	.90	1.17	.75
Anxiety	1.65	1–4	.62	.84	1.15	.89
Stress	1.88	1–4	.65	.86	.69	–.08
Sample 2[b]						
MW-D	4.55	1–7	1.42	.89	–.31	–.40
MW-S	4.22	1–7	1.42	.88	–.19	–.45
Depression	1.80	1–4	.74	.92	1.01	.22
Anxiety	1.68	1–4	.64	.86	1.08	.62
Stress	1.94	1–4	.66	.85	.61	–.20

Note. MW-D = Mind Wandering–Deliberate scale; MW-S = Mind Wandering–Spontaneous Scale.
[a] $SE_{skewness}$ = .05, $SE_{kurtosis}$ = .10. [b] $SE_{skewness}$ = .05, $SE_{kurtosis}$ = .11.

ment error" (Jensen, 1998). As can be seen in Table 2, which presents both the disattenuated (corrected) and uncorrected correlations, although the corrected correlations are larger than their uncorrected counterparts, the overall pattern of results is the same. Thus, for the sake of brevity, in our discussion of these results we focus on the raw, uncorrected correlations.

As in previous work (e.g., Carriere et al., 2013), the MW-D and MW-S were moderately positively correlated in both samples. Furthermore, and consistent across both samples, we observed significant positive relations between both the MW-D and MW-S with all three facets of the DASS-21, indicating that people reporting higher symptoms of depression, anxiety, and stress tended to also report higher levels of both intentional and unintentional mind wandering.

Partial Correlation Analyses

Because the MW-D and MW-S were moderately correlated across our two samples, we next examined their unique contributions to symp-

Table 2
Pearson Product–Moment Correlation Coefficients for All Measures for Sample 1 (N = 2,581) and Sample 2 (N = 2,107)

Sample	MW-D	MW-S	Depression	Anxiety	Stress
Sample 1					
MW-D	—	.398***	.128***	.131***	.114***
MW-S	.451***	—	.378***	.359***	.381***
Depression	.144***	.425***	—	.688***	.711***
Anxiety	.152***	.417***	.791***	—	.779***
Stress	.131***	.439***	.811***	.918***	—
Sample 2					
MW-D	—	.549***	.186***	.132***	.148***
MW-S	.619***	—	.388***	.318***	.374***
Depression	.206***	.431***	—	.696***	.740***
Anxiety	.151***	.366***	.786***	—	.779***
Stress	.170***	.431***	.837***	.912***	—

Note. MW-D = Mind Wandering–Deliberate scale; MW-S = Mind Wandering–Spontaneous scale. Uncorrected correlation coefficients are presented above the diagonals; disattenuated (corrected) correlation coefficients are presented below the diagonals.
*** $p < .001$ (two-tailed).

toms of depression, anxiety, and stress scores from the DASS-21. To this end, for each sample, we examined the partial correlations between the MW-S and each of the three facets of the DASS-21 while controlling for the MW-D, and the partial correlations between the MW-D and each of the three facets of the DASS-21 while controlling for the MW-S (see Table 3). As with the zero-order correlations presented above (see Table 2), we again corrected for measurement error by also computing disattenuated partial correlation coefficients (see Table 2). As can be seen in Table 2, although the corrected partial correlations are larger than the uncorrected partial correlations, the overall pattern of results is mostly the same. As such, and again, for the sake of brevity, our discussion of these results focuses on the raw, uncorrected correlations.

Across both samples, the partial correlations between the MW-S and three facets of the DASS-21 were all positive, significant, and relatively large. Importantly, these results indicate that people who more frequently engage in unintentional mind wandering tend to experience more symptoms of depression, anxiety, and stress. On the other hand, the partial correlations between the MW-D and the three facets of the DASS-21 were somewhat mixed. First, the MW-D was not significantly associated with depression, and this was true across both samples. Second, although the MW-D was nonsignificantly related to anxiety in Sample 1, a significant negative relation was observed in Sample 2. Lastly, across both samples, the MW-D was significantly negatively associated with stress.[4] These results might be taken to suggest that people who more frequently intentionally mind wander tend to experience lower levels of anxiety (although this finding was mixed) and stress. However, it is worth emphasizing that the MW-D contributed a notably low level of predictive power, and the correlation coefficients were significant only because of the very large samples. Thus, the results of the partial correlation analyses indicate that, whereas unintentional mind wandering is strongly independently related to symptoms of depression, anxiety, and stress, intentional mind wandering is, at best, very weakly associated with anxiety and stress.

Discussion

Across two large, independent samples, we sought to examine the relations among trait levels of intentional and unintentional mind wandering and symptoms of depression, anxiety, and stress. Results indicated that, whereas unintentional mind wandering was strongly and positively related to symptoms of depression, anxiety, and stress, intentional mind wandering was very weakly negatively associated with such symptoms. Consistent with our hypothesis, the results indicate that people who more frequently engage in unintentional mind wandering also tend to report higher levels of depression, anxiety, and stress.

Although our findings clearly demonstrate that trait-level reports of unintentional mind wandering are positively associated with affective dysfunction, what we cannot determine is the causal structure of these relationships. One possibility is that higher rates of unintentional mind wandering cause symptoms of depression, anxiety, and stress, because such mind wandering precludes a desired optimal level of engagement with one's environment (see Eastwood, Frischen, Fenske, & Smilek, 2012, for a similar discussion pertaining to the experience of boredom). Another possibility is that depression, anxiety, and stress cause higher rates of unintentional mind wandering. This possibility is consistent with time-lag studies examining the causal relation between overall mind wandering (i.e., the sum of both intentional and unintentional types) and mood, which have suggested that changes in mood precede changes in rates of mind wandering (Poerio, Totterdell, & Miles, 2013; Smallwood et al., 2009). Given these prior findings, it seems reasonable to assume

[4] When examining the disattenuated partial correlations, we find that the MW-D is significantly negatively related to depression, anxiety, and stress, and this is true across both samples. However, the pattern of results emerging when examining the disattenuated partial correlations and the uncorrected partial correlations is essentially the same, with the only difference being that the slight increase in the magnitude of the disattenuated partial correlations produced significant results. In any case, the disattenuated partial correlations were all relatively small in magnitude, and significant only because (a) the correction was disattenuated and (b) the samples are very large. Thus, we refrain from making any strong claims about the possible negative relations between the MW-D and depression, anxiety, and stress.

Table 3
Partial Correlation Coefficients Showing the Unique Contributions to Symptoms of Depression, Anxiety, and Stress by Intentional (Mind Wandering–Deliberate [MW-D]) and Unintentional Mind Wandering (Mind Wandering–Spontaneous [MW-S]; Sample 1: N = 2,581, Sample 2: N = 2,107)

Sample	Depression	Anxiety	Stress
Sample 1			
MW-D (controlling for MW-S)	–.026 (–.060**)	–.014 (–.045*)	–.044* (–.084***)
MW-S (controlling for MW-D)	.359*** (.408***)	.338*** (.395***)	.368*** (.429***)
Sample 2			
MW-D (controlling for MW-S)	–.035 (–.086***)	–.054* (–.103***)	–.074** (–.137***)
MW-S (controlling for MW-D)	.348*** (.395***)	.297*** (.350***)	.354*** (.421***)

Note. Uncorrected partial correlation coefficients are presented without parentheses; disattenuated (corrected) partial correlation coefficients are presented within parentheses.
* $p < .05$. ** $p < .01$. *** $p < .001$ (two-tailed).

that mood specifically influences levels of unintentional mind wandering. Of course, because the results of time-lag analyses may depend heavily on the specific lag chosen, there remains the possibility that both causal directions accurately describe the relation between mind wandering and negative affect, though perhaps at different lags. A final possibility is that unintentional mind wandering, depression, anxiety and stress are all related because of their relations to another factor, such as reduced or impaired cognitive control, which might manifest, physiologically, in terms of an impairment of control-related brain areas, such as the prefrontal cortex.

One notable limitation of the present study concerns the extent to which the questionnaires we used to index rates of intentional and unintentional mind wandering conflate unique varieties of mind wandering. For instance, the MW-S and MW-D likely conflate the task-unrelated-thought variety of mind wandering (e.g., Smallwood & Schooler, 2006) with the stimulus-independent-thought variety (e.g., Mason et al., 2007), because the items of these scales do not distinguish between these two varieties of mind wandering. As suggested in recent work (Seli, Kane, et al., 2018), however, it is important for researchers to isolate and separately discuss different varieties of mind wandering because different varieties can have unique causes, consequences, and associates (e.g., Agnoli, Vanucci, Pelagatti, & Corazza, 2018; Seli, Risko, & Smilek, 2016). As such, although our results indicate that the MW-S can be used to predict people's symptoms of depression, anxiety, and stress, it is not clear which specific variety (or varieties) of unintentional mind wandering are associated with these three types of affective dysfunction; hence, we encourage the reader to take caution in generalizing these results to all varieties of mind wandering. Also unclear is whether the present findings would obtain at the state level, in the laboratory. Because parallel findings at the state level would bolster the present findings, we suggest that future research explore this possibility.

Two important points arise from the foregoing. First, to our knowledge, researchers have yet to develop trait-level questionnaires of mind wandering that separately index different varieties of this experience (e.g., task-unrelated thought, stimulus-independent thought, ruminative thought, and unconstrained thought). Thus, future research will benefit from the development of such questionnaires, which will permit researchers to more clearly specify the type of mind wandering under investigation. Second, given that our results cannot speak to the specific variety (or varieties) of unintentional mind wandering that are associated with depression, anxiety, and stress, it will be worthwhile for future research to determine the extent to which the present results generalize to different varieties of unintentional mind wandering.

References

Agnoli, S., Vanucci, M., Pelagatti, C., & Corazza, G. E. (2018). Exploring the link between mind-wandering, mindfulness, and creativity: A multidimensional approach. *Creativity Research Journal, 30,* 41–53. http://dx.doi.org/10.1080/10400419.2018.1411423

Antony, M. M., Bieling, P. J., Cox, B. J., Enns, M. W., & Swinson, R. P. (1998). Psychometric properties of the 42-item and 21-item versions of the Depression Anxiety Stress Scales in clinical groups and a community sample. *Psychological Assessment, 10,* 176–181. http://dx.doi.org/10.1037/1040-3590.10.2.176

Black, P. H. (2002). Stress and the inflammatory response: A review of neurogenic inflammation. *Brain, Behavior, and Immunity, 16,* 622–653. http://dx.doi.org/10.1016/S0889-1591(02)00021-1

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

Carriere, J. S., 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,* 19–31.

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

Eastwood, J. D., Frischen, A., Fenske, M. J., & Smilek, D. (2012). The unengaged mind: Defining boredom in terms of attention. *Perspectives on Psychological Science, 7,* 482–495. http://dx.doi.org/10.1177/1745691612456044

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. http://dx.doi.org/10.1016/j.biopsycho.2014.10.004

Frodl, T., & O'Keane, V. (2013). How does the brain deal with cumulative stress? A review with focus on developmental stress, HPA axis function and hippocampal structure in humans. *Neurobiology of Disease, 52,* 24–37. http://dx.doi.org/10.1016/j.nbd.2012.03.012

Jensen, A. R. (1998). *The g factor: The science of mental ability*. Westport, CT: Praeger.

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,* 614–621. http://dx.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,* 932. http://dx.doi.org/10.1126/science.1192439

Kline, R. B. (1998). *Principles and practice of structural equation modeling*. New York, NY: Guilford Press.

Liston, C., McEwen, B. S., & Casey, B. J. (2009). Psychosocial stress reversibly disrupts prefrontal processing and attentional control. *Proceedings of the National Academy of Sciences of the United States of America, 106,* 912–917. http://dx.doi.org/10.1073/pnas.0807041106

Mahoney, A. M., Dalby, J. T., & King, M. C. (1998). Cognitive failures and stress. *Psychological Reports, 82,* 1432–1434. http://dx.doi.org/10.2466/pr0.1998.82.3c.1432

Mason, M. F., Brown, K., Mar, R. A., & Smallwood, J. (2013). Driver of discontent or escape vehicle: The affective consequences of mindwandering. *Frontiers in Psychology, 4,* 477. http://dx.doi.org/10.3389/fpsyg.2013.00477

Mason, M. F., Norton, M. I., Van Horn, J. D., Wegner, D. M., Grafton, S. T., & Macrae, C. N. (2007). Wandering minds: The default network and stimulus-independent thought. *science, 315,* 393–395.

Miller, A. H., Maletic, V., & Raison, C. L. (2009). Inflammation and its discontents: The role of cytokines in the pathophysiology of major depression. *Biological Psychiatry, 65,* 732–741. http://dx.doi.org/10.1016/j.biopsych.2008.11.029

Miller, G. E., Chen, E., & Zhou, E. S. (2007). If it goes up, must it come down? Chronic stress and the hypothalamic-pituitary-adrenocortical axis in humans. *Psychological Bulletin, 133,* 25–45.

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. http://dx.doi.org/10.1016/j.biopsycho.2015.02.011

Ottaviani, C., Shapiro, D., & Couyoumdjian, A. (2013). Flexibility as the key for somatic health: From mind-wandering to perseverative cognition. *Biological Psychology, 94,* 38–43. http://dx.doi.org/10.1016/j.biopsycho.2013.05.003

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

Popoli, M., Yan, Z., McEwen, B. S., & Sanacora, G. (2011). The stressed synapse: The impact of stress and glucocorticoids on glutamate transmission. *Nature Reviews Neuroscience, 13,* 22–37. http://dx.doi.org/10.1038/nrn3138

Raison, C. L., Capuron, L., & Miller, A. H. (2006). Cytokines sing the blues: Inflammation and the pathogenesis of depression. *Trends in Immunology, 27,* 24–31. http://dx.doi.org/10.1016/j.it.2005.11.006

Seli, P., Beaty, R. E., Cheyne, J. A., Smilek, D., Oakman, J., & Schacter, D. L. (2018). How pervasive is mind-wandering, really? *Consciousness*

and Cognition, 66, 74–78. http://dx.doi.org/10.1016/j.concog.2018.10.002

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,* 479–490. http://dx.doi.org/10.1016/j.tics.2018.03.010

Seli, P., Risko, E. F., Purdon, C., & Smilek, D. (2017). Intrusive thoughts: Linking spontaneous mind-wandering and OCD symptomatology. *Psychological Research, 81,* 392–398. http://dx.doi.org/10.1007/s00426-016-0756-3

Seli, P., Risko, E. F., & Smilek, D. (2016). On the necessity of distinguishing between unintentional and intentional mind-wandering. *Psychological Science, 27,* 685–691. http://dx.doi.org/10.1177/0956797616634068

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

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

Smallwood, J., Fitzgerald, A., Miles, L. K., & Phillips, L. H. (2009). Shifting moods, wandering minds: Negative moods lead the mind to wander. *Emotion, 9,* 271–276. http://dx.doi.org/10.1037/a0014855

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

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