Is There a Positive Association between Working Memory Capacity and Mind Wandering in a Low-Demand Breathing Task? A Preregistered Replication of Levinson, Smallwood, and Davidson (2012)

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Abstract

Levinson, Smallwood, and Davidson (2012, Experiment 2) found that working memory capacity (WMC) correlated positively with mind-wandering rates measured by thought probes in a breath-monitoring task, but was unassociated with the tendency to self-catch mind-wandering. Here, I sought to replicate the associations between mind-wandering and WMC in the Levinson et al. breath task. With data collected from three hundred and fifteen subjects (*ns* differ among analyses) and two measures of WMC, the data from the current study suggest that, if WMC correlates with probe-caught mind wandering, it is most likely negative. In addition, the evidence regarding self-caught mind wandering is consistent with Levinson et al. for the sum of self-caught responses, but when self-caught responses are considered in proportion to probe-caught mind wandering, modest evidence was found for a positive association with WMC.

Keywords: mind wandering, working memory capacity, individual differences, cognitive control, replication

Is There a Positive Association between Working Memory Capacity and Mind Wandering in a Low-Demand Breathing Task? A Preregistered Replication of Levinson, Smallwood, and Davidson (2012)

A point of theoretical contention in mind-wandering research exists around the role of working memory capacity (WMC). Some theorists have provided evidence and argued that WMC is primarily related to mind-wandering through its associated cognitive-control capabilities, which help people avoid the distraction of mind-wandering to focus on a primary task (McVay & Kane, 2010). Evidence comes from laboratory work where subjects with higher-WMC report less mind-wandering than do subjects with lower-WMC (Kane et al., 2016; McVay & Kane, 2009; McVay & Kane, 2012a, 2012b). Other theorists propose that mind-wandering requires resources and thus suggest those with a higher-WMC will mind wander more than those with a lower WMC (Smallwood, 2010). Evidence for this claim comes from lab studies that show a positive association between WMC and mind-wandering in undemanding contexts (Levinson et al., 2012; Rummel & Boywitt, 2014).

These apparently contradictory findings (i.e., positive and negative associations between WMC and mind-wandering) have led to theorizing that task context moderates the role of WMC (Kane et al., 2007; Rummel & Boywitt, 2014; Smallwood & Andrews-Hanna, 2013). That is, in situations that impose moderate to heavy cognitive demands, WMC limits the influence of mind-wandering on the subject's ability to the perform the task, but when the cognitive demands are relatively low, higher-WMC affords more mind-wandering. The evidence provided by Levinson et al. (2012) is key for such theorizing as there are relatively few studies that have reported a positive association.

In Levinson et al.'s (2012) first study, subjects completed a visual search task in blocked high and low perceptual-load conditions. Subjects responded to thought probes at the end of eight task blocks. These thought probes asked subjects, "What were you thinking right now?". Subjects could either respond that they were thinking task-related or unrelated thoughts. Task-unrelated thoughts were operationalized as mind wandering. This search task was followed by the operation span task to measure WMC. Analysis of 78 subjects found that WMC correlated positively with mind-wandering in the low load condition ($r = .28$), but not in the high load condition ($r = -.03$). Because the authors were concerned that WMC-related task difficulty may have contributed to this pattern of results (higher WMC-subjects showed less response competition from visual distractors), they conducted a second study. In this study, subjects completed a breath-monitoring task (for details, see *Methods* below) and an operation span task. Here, with (only) 42 subjects, mind-wandering correlated positively with WMC ($r = .33$). Additionally, in this breath-monitoring study, subjects were instructed to report instances when they caught themselves mind-wandering. Self-caught mind-wandering episodes were not associated with WMC ($r = -.05$).

Because of the potential task-difficulty confound in Levinson et al.'s (2012) first study, the second, breath-monitoring study, provides the critical findings lending the most support that WMC and probe-caught mind-wandering are positively associated. As an empirical pillar for the theorizing described above, this paper has elicited 159 citations on Google Scholar as of December 17, 2018. Its theoretically strongest evidence comes from a correlation analysis of 42 subjects, but correlations with samples this size are unstable (Schönbrodt & Perugini, 2013), thus the correlation estimate of .33 provides imprecise information and the true population value may substantially differ (the 95% confidence interval for this correlation was [.03, .58]).

The Current Study

The primary goal here was to test the association between WMC and mind-wandering during the breathing task used by Levinson et al. (2012), but with more precision allowed from a larger subject sample. Because WMC is considered a domain-general construct (Kane et al., 2004) and is measured better with two tasks than one (Foster et al., 2015), I measured WMC with two complex span tasks. In addition, without justification, Levinson et al. only tested for an association with mind-wandering in one out of three sections of the task that included thought probes. Because I could think of no obvious reason to exclude these two sections, I included them in my analyses (of mind-wandering as measured by thought probes). Following from Levinson et al., I also analyzed self-caught probes from the same section of the breathing task.

Method

I report how I determined the sample size, all data exclusions, all manipulations, and all measures in the study (Simmons, Nelson, & Simonsohn, 2011). This study was preregistered on February 2, 2017 (https://aspredicted.org/kw8a5.pdf).

Subjects

Three hundred and twenty subjects from Western Carolina University completed the informed consent for this study. I collected demographic data from 315 of these subjects (data from 5 subjects were lost because of technical errors). Of these 315 subjects, 58% were female. Subjects had a mean age of 19 (SD = 1); one subject reported an age of 57 in the demographics, and because that was beyond the preregistered age range[1], their data were not included in this calculation or any further analyses). Of the subjects who gave ethnicity information (6 subjects declined), 80% identified as white, 10% as black, 4% as multiracial, 2% as Asian, 2% as Native American or Alaskan Native, and 2% as other. Subjects received partial credit for a course requirement as compensation for their participation. The stopping rule for data collection was the end of the semester in which at least 220 subjects had scores on both the operation and symmetry span complex span tasks that met the processing accuracy criterion (see below for a description of this criterion). This sample size was chosen on the basis that correlations as weak as $\rho = .10$ stabilize within a narrow window when approaching 250 subjects (Schönbrodt & Perugini, 2013) thus allowing precise estimates. Data collection terminated at the end of the Spring 2018 semester.

General Procedure

Subjects completed one 90-minute session in groups of up to 2, with the following task order: operation span, breathing task, symmetry span, then a demographic questionnaire. Experimenters read all on-screen instructions aloud while subjects read along silently. An experimenter was always present in the room. All tasks were programmed and administered with E-prime software (Psychology Software Tools, Pittsburg, PA). The session protocol and all task instructions are available at https://osf.io/8cwgx/.

Breath-Monitoring Task

This task was provided by the lead author of Levinson et al. (2012). It had three sections. During all three, subjects were presented with a pair of thought probe questions that appeared at experimenter-specified intervals from 60-120 s. The first probe asked subjects “Just now, where was your attention?”. Subjects responded by using a 6-point Likert scale (1 = “completely ON-task, 6 = “completely OFF-task”). The second probe asked, “How aware were you of where your attention was?”. Subjects again responded using a 6-point Likert scale (1 = “completely aware”, 6 = “completely unaware”). Following Levinson et al. (and the study preregistration), only responses to the first question were analyzed in this study. As per the original study, a response was considered an endorsement of mind-wandering if it was rated as 4 or higher.

In the first section, hereafter called the baseline section, subjects were instructed to “Please be aware of the movement of breath in and out in the space below your nose and above your upper lip” and that “there's no need to control the breath. Just breathe normally.” In addition, they were informed that they would encounter thought probes. Subjects completed some brief practice (i.e., 15 s of a black screen that concluded with thought probes), before beginning the scored portion of this section. Before beginning the scored portion, they were instructed to keep their eyes open and resting on the screen during the experiment. During this section of the task when there was not a thought probe on the screen, the screen was black and blank. This portion of the task lasted 6 minutes and presented the subjects with 4 sets of probes. The intervals for the probes were in the following order: 90, 60, 120, and 90 s.

During the second section of the task, the counting section, subjects were instructed that every time they exhaled they should count up by one and press the letter A (on the keyboard) with their pinkie finger; every time that their count reached nine, they were to press the letter F with their pointer finger and subsequently restart counting from one. If the subject lost count, they were instructed to press the control key. This section lasted 18 min and presented 12 sets of thought probes. The intervals for the probes were in the following order: 90, 60, 120, 90, 105, 75, 90, 60, 120, 90, 105, and 75 s. Before beginning the scored part of this section, subjects completed a short practice that culminated with a probe.

The final section of this task is the one used in the Levinson et al. (2012) analyses. Subjects were instructed to press the letter L with every exhale and to press the control button if they “suddenly realize” that they were off-task. Following Levinson et al., I call this the awareness section. This section took 9 min and presented 6 pairs of thought probes. The probes were positioned at the following times: 90, 60, 120, 90, 105, and 75 s.

WMC Complex Span Tasks

WMC was assessed with two complex span tasks, in which subjects memorized short sequences of items while completing an interleaved processing task (Unsworth, Heitz, Schrock, & Engle, 2005). Following trial sequences of unpredictable length, subjects recalled the memorial items in serial order.

Before beginning the scored portion of the task, subjects practiced memorizing small sets, practiced the processing task alone, and then practiced both task components together. From the processing-only practice, an individualized response deadline was set. If on any processing-task portion of a trial, a response was not made within 2.5 standard deviations of the subject's processing-only practice RT mean, the program skipped the subsequent memory stimulus and recorded a processing error. All subjects were instructed that if they did not achieve 85% accuracy on the processing portion of the task, their data would not be used in analyses (see Meier, Smeekens, Silvia, Kwapil, and Kane [2018] for a rationale for this criterion).

Operation Span. Subjects memorized sequences of 3–7 letters (each letter was presented for 1 s). These letters appeared in alternation with an arithmetic equation to verify [e.g., $(3 \times 2) - 1 = 4$; half were true]. At recall, all 12 letters (used in the task, but not necessarily in any one specific trial) appeared in a grid; subjects selected recalled letters with a computer mouse click. Each set length of 3–7 occurred three times in a random order for each subject. The variable used in analyses was the total number of letters recalled in correct serial position (of 75; i.e., partial-credit scoring [Conway et al., 2005]). Because Levinson et al. squared operation span scores to make the distribution of scores more normal, I did that here as well (in addition to reporting analyses with raw scores).

Symmetry Span. Subjects memorized sequences of 2–5 red squares appearing within a matrix. Each red square appeared (for 650 ms) in alternation with a black-and-white pattern made from an 8 × 8 grid to verify if it was vertically symmetrical (half were symmetrical). At recall, subjects saw an empty 4 × 4 matrix and mouse-clicked the red square locations. When a square was clicked upon, a number indicating the serial position of the presentation of that square appeared in that square. Each set length of 2–5 occurred three times in a random order for each subject. Each subject's score was the total number of red-square locations recalled in correct serial position (of 42). These scores were squared for analyses (but also reported and analyzed as raw scores).

Data Analysis

Per the preregistration[2], my initial approach followed the analytic pipeline used by Levinson et al. (2012). I supplemented these analyses by computing Bayes Factors (BFs) and 95% credible intervals (*CI*). BFs compare the predictive performance of competing models (Kass & Raferty, 1995), and credible intervals quantify uncertainty of the estimate given the data (Wagenmakers et al., 2018). In addition to the analyses on the awareness condition of the breathing task conducted in Levinson et al., I tested associations between WMC and mind-wandering rates (i.e., the proportion of the thought probes where the subject endorsed mind wandering) in the baseline and counting portions of the task, as well as an overall rate of mind-wandering across all three sections. Additional analyses were conducted on self-caught instances of mind-wandering. I performed analyses in the R system for statistical analysis (R Core Team, 2017). Data, analysis code, and outputs are available at the following link: https://osf.io/8cwgx/ .

Data Loss

All data exclusions were made in accord with the preregistration. I dropped all data for five subjects who were deemed by experimenters as noncompliant with instructions across tasks. These decisions were made without consulting the subjects’ data. Because of computer or experimenter error, I am missing data from five subjects in the breathing task, two subjects in the operation span task, and eight subjects in the symmetry span task. Fifty-six subjects did not meet the accuracy criterion for the operation span (18% of subjects who took it), and 46 subjects did not meet this criterion for the symmetry span (15% of the subjects who took it). For all the following analyses, I used the maximum amount of data available (after these exclusions; therefore, Ns differ among analyses). Descriptive statistics for all tasks (before and after exclusions) can be seen in the supplementary materials (Tables S1 and S2). Intercorrelations for measures can be seen in Table 1 (intercorrelation among measures before exclusions can be seen in the supplementary materials; Table S3).

Results

Table 1. Correlations Among Measures After Exclusions

	1	2	3	4	5	6	7	8	9	10	11	12
1. Baseline Mind-wandering	1											
2. Counting Mind-wandering	0.51	1										
3. Awareness Mind-wandering	0.49	0.69	1									
4. Cumulative Mind-wandering	0.69	0.94	0.85	1								
5. Self-caught Mind-wandering	0.21	0.21	0.27	0.26	1							
6. Self-caught Mind-wandering Ratio	-0.20	-0.26	-0.18	-0.26	0.57	1						
7. Self-caught Mind-wandering Ratio Square Root	-0.16	-0.16	-0.08	-0.16	0.70	0.90	1					
8. Operation Span	-0.09	-0.18	-0.15	-0.18	-0.03	0.17	0.15	1				
9. Symmetry Span	-0.14	-0.22	-0.14	-0.21	-0.08	0.13	0.12	0.49	1			
10. Operation Span Squared	-0.13	-0.19	-0.16	-0.20	-0.01	0.20	0.18	0.98	0.48	1		
11. Symmetry Span Squared	-0.14	-0.24	-0.13	-0.22	-0.06	0.15	0.14	0.49	0.98	0.49	1	
12. Working Memory Composite	-0.08	-0.21	-0.16	-0.20	-0.03	0.19	0.17	0.86	0.87	0.84	0.86	1

Working Memory and Probe-caught Mind Wandering Measurements

In contrast to Levinson et al. (2012), squared operation span scores were negatively associated with mind-wandering probes during the awareness portion of the breathing task, *r* (251) = -.16, *p* = .009, *CI* [-.28, -.04]. The BF_{10} associated with this estimate is 2.2, suggesting that given this data the alternative hypothesis ($r \neq 0$) is weakly favored over the null hypothesis ($r = 0$). To quantify how the data from this study updates the estimate derived from the original study, I computed a replication BF. In a replication BF, the correlation from the original study is entered as the prior and then it is updated with the correlation from the current study. This BF tracks any change in evidence provided by the replication study from the evidence provided by the original study (Ly, Etz, Marsman, & Wagenmakers, 2017). When data from a replication attempt indicate a result in the opposite direction from the to-be-replicated study (as is the case here), a one-sided test is required (see Appendix C of Ly et al., 2017). The one-sided test asks whether the result in the replication study, after accounting for the original study, is more consistent with the null hypothesis or a positive association like the one found in Levinson et al. (i.e., *r*[40] = .33). The result of this analysis was a replication BF of 105, suggesting that the data are 105 times more likely under the null hypothesis than the alternative hypothesis of a positive association. These same analyses were mirrored with non-transformed operation span scores and produced (without exception and not surprising, considering the correlations of near one between span and squared span scores) nearly identical numbers (the correlations among mind-wandering scores and all variations of WMC scores can be seen it Table 1) and inferential results for non-transformed WMC scores are presented in supplementary materials (https://osf.io/8cwgx/).

As can be seen in the correlation matrix, in addition to finding a negative association between squared operation scores and mind-wandering during the awareness portion of the task (the analysis conducted by Levinson et al.), squared operation span scores also correlated negatively with mind wandering rates in the baseline, *r*(251) = -.13, *p* = .044, *CI* [-.25, .01], BF_{10} = .59, and counting, *r*(251) = -.19, *p* = .002 , *CI* [-.31, -.07], BF_{10} = 8, sections of the breathing task (see Figure 1). As indicated by the BF_{10} of less than 1, the association between operation span squared and mind-wandering in the baseline section is slightly in favor the null hypothesis rather than a negative association, while the association between counting section mind-wandering and mind-wandering presents more convincing evidence for a negative association.

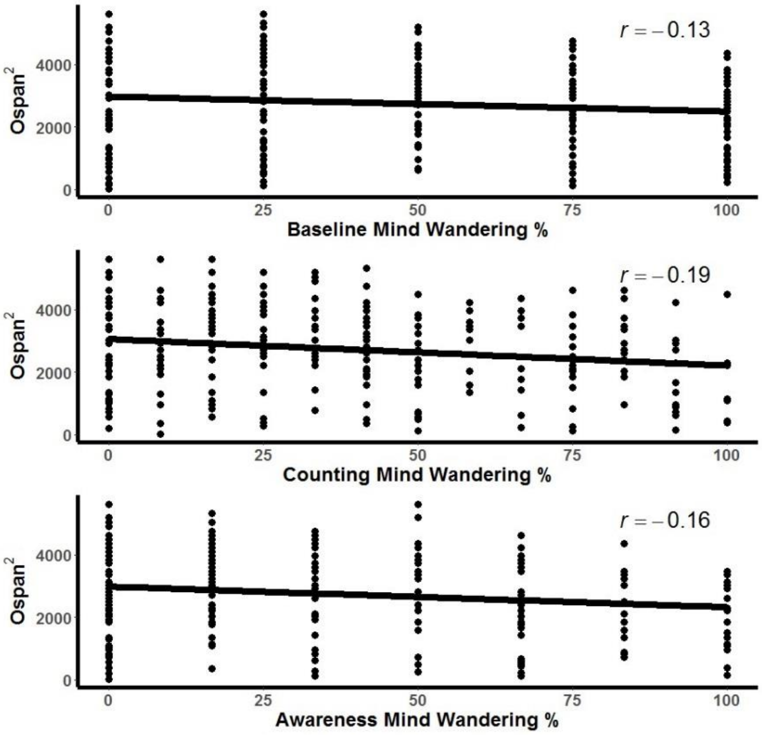

Figure 1. Scatter plot with best-fitting regression line showing the association between squared operation span scores (Ospan^2) and percent of thought probes scored as mind-wandering in the three sections of the breathing task.

Analyses of the symmetry span results and the WMC composite (formed by z-scoring and averaging symmetry span and operation span scores) produced results largely consistent with those found with the operation span. The correlations between symmetry span squared and mind-wandering in the baseline *r*(258) = -.14, *p* = .019, *CI* [-.26 , -.03], BF_{10} = 1.18, counting, *r*(258) = -.24, *p* < .001, *CI* [-.35, -.12], BF_{10} = 124, and awareness, *r*(258) = -.13, *p* = .039, *CI* [-.25, .01], BF_{10} = .63, sections were all negative with only the association between symmetry span squared and counting mind-wandering providing strong evidence against the null hypothesis. When looking at associations between the WMC composite and mind-wandering, negative associations are found in the baseline, *r*(213) = -.08, *p* = .249, *CI* [-.21, .06], BF_{10} = .16, counting, *r*(213) = -.21, *p* = .002, *CI* [-.34, -.08], BF_{10} = 9.78, and awareness sections, *r*(213) = -.16, *p* = .018, *CI* [-.29, -.02], BF_{10} = 1.34. As can be seen here, the evidence for a negative association varies considerably by section, with the baseline section favoring the null hypothesis, the counting section the negative association, and the awareness section being indeterminate between the two. As well as looking at associations among operation span, symmetry span, the WMC composite and mind-wandering during the separate sections of the breathing task, I also tested for an association between these WMC measures and the overall percentage of mind-wandering reports across the three breathing task sections. Squared operation span scores were negatively associated with mind-wandering across the entire breathing task, *r*(251) = -.20, *p* = .002, *CI* [-.31, -.07], BF_{10} = 10, as were symmetry span scores, *r*(258) = -.22, *p* < .001, *CI* [-.33, -.10], BF_{10} = 40, and the WMC composite, *r*(213) = -.20, *p* = .004, *CI* [-.33, -.07], BF_{10} = 5.6. The data from these analyses are consistent in supporting the negative association over the null.

To better determine how the current findings fit with previously reported results from latent variable analyses, I conducted a confirmatory factor analysis (CFA; see Figure 2) that had the complex span scores load onto a latent WMC factor and the mind-wandering rates from the three breathing task sections load onto a latent mind-wandering factor. The model was estimated using maximum likelihood with the missingness option set to full information maximum likelihood. The fit of this model was good, $\chi^2(4) = 5.17$, $p = .270$, root-mean-square error approximation = .03, standardized-root-mean-square residual = .02, comparative fit index = .99. Central to the focus of this study, the correlation between the latent WMC and mind-wandering factors was -.32 (with a standard error of .08).

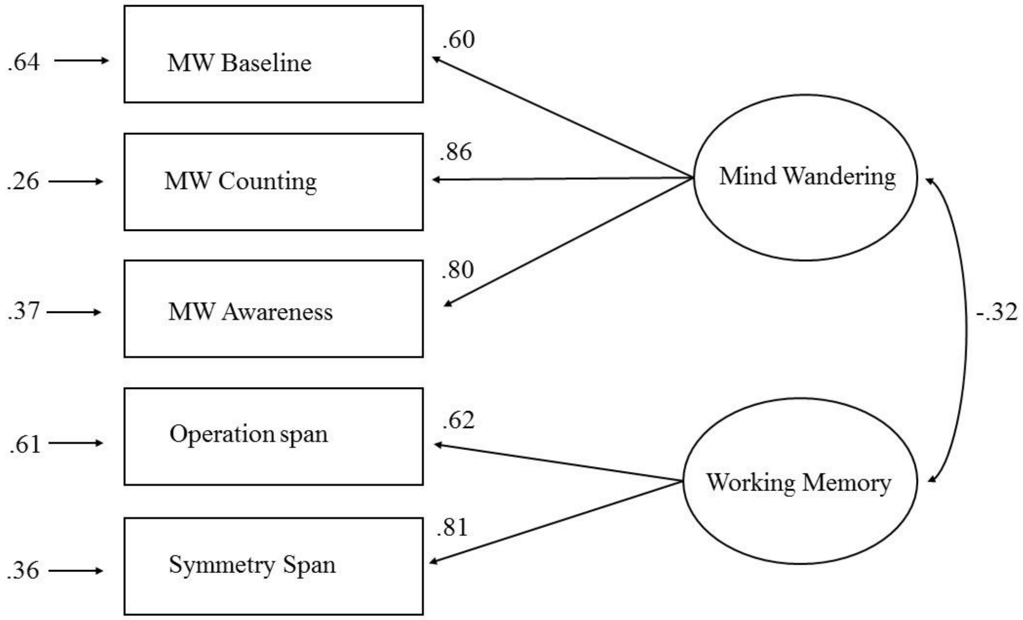

Figure 2. Confirmatory factor analysis for WMC (working memory) and mind-wandering. The path connecting WMC and mind-wandering represents the correlation between the constructs, the numbers next to the arrows that go from the latent variables to the manifest variables (squares) represent the loadings of each task onto the latent variable, and the numbers appearing next to each manifest variable represent the error variance associated with each task. MW Baseline = Mind-wandering Rate during Baseline Portion of Breathing Task; MW Counting = Mind-wandering Rate during Counting Portion of Breathing Task; MW Awareness = Mind-wandering Rate during Awareness Portion of Breathing Task.

Working Memory and Self-caught Mind Wandering Measurements

Like Levinson et al. (2012), when looking at the sum of instances of self-caught mind-wandering (from the awareness portion), there was no evidence for a WMC association: WMC composite, *r*(213) = -.03, *p* = .637, *CI* [-.12, .18], BF_{10} = .10, squared operation span, *r*(251) = -.01, *p* = .852, *CI* [-.08, .20], BF_{10} = .08 (this was the analysis conducted by Levinson et al.), squared symmetry span, *r*(258) = -.06, *p* = .354, *CI* [-.10, .18], BF_{10} = .12. However, the inference changed when examining self-caught mind-wandering as a ratio with the sum of experimenter-administered thought probes for which the subject indicated mind-wandering (i.e., the sum of self-caught mind wandering endorsements divided by the sum of probes indicating mind wandering; Sayette, Schooler, & Reichle, 2010); this measure reflects meta-awareness, or the extent to which subjects catch themselves mind-wandering rather than being caught mind-wandering by a probe (while controlling for the total amount of mind wandering being experienced). For these analyses, I included only subjects who had at least one report of probe-caught mind-wandering, which eliminated the problem of having zeros in the denominator; this decision was made after making the ratio and seeing that some subjects either had a ratio described as not a number and others as infinity. The ratio had a positive skew (3.92) so a square-root transformation was used to reduce it (after transformation: 1.41). All three WMC measures had a positive association with the self-caught ratio, indicating greater meta-awareness of mind-wandering for higher WMC subjects: WMC composite, *r*(193) = .17, *p* = .016, *CI* [.01, .30], BF_{10} = 1.57, squared operation span, *r*(228) = .18, *p* = .005, *CI* [.04, .30], BF_{10} = 4, squared symmetry span, *r*(234) = .14, *p* = .031, *CI* [.003, .26], BF_{10} = .82.

Discussion

The present results conflict with those reported in Levinson et al. (2012). Leaning heavily on those original findings (or any one study with a small sample) as support for theories may impede progress. More specifically, the empirical basis for a positive association between WMC and probe-caught mind-wandering is not sound, as no evidence for this relation was found in this preregistered replication using a large subject sample and better WMC measurement. This study corroborated the Levinson et al. finding that the sum of self-caught probes in the awareness section did not correlate with WMC. However, when a ratio of self-caught to probe-caught mind-wandering was used, modest evidence was found for a positive association between WMC and self-caught probes. Thus, higher-WMC subjects, when they mind-wander, may be more aware and alert to these episodes than are lower WMC subjects; that is, metaconscious-monitoring individual differences (Seli, Smilek, Ralph, & Schacter, 2018) may be associated with WMC.

The lack of a positive association between WMC and mind-wandering rates in low-demand lab tasks has recently gathered additional support. Robinson and Unsworth (2017) conducted a latent-variable analysis that assessed the relation between a factor composed of three complex span tasks and a mind-wandering factor from two low-demand reaction time tasks. The association between these factors was -.28, a remarkably close estimate to that from the current study (-.32). Robinson and Unsworth pointed out that -.28 is very similar to estimates derived from six latent-variable studies using more complex and demanding tasks to assess mind-wandering (Kane et al., 2016; McVay & Kane, 2012a; McVay & Kane, 2012b; Robison et al., 2017; Unsworth & McMillan, 2013; Unsworth & McMillian, 2014). The estimates for the association between WMC and mind-wandering factors in these studies ranged from -.17 to -.41. The estimate from the current study falls squarely within this range.

This lack of a positive association between WMC and mind-wandering rates may be specific to work done in the lab. Some work assessing mind-wandering in daily life has provided evidence that when subjects try less than usual to concentrate, subjects with higher-WMC mind wander more than lower-WMC subjects (Kane et al., 2007; Kane et al., 2017). Although this work done outside of the lab could benefit greatly from independent replication, if the distinction between lab and daily studies is brought into sharp relief, it has potential to reveal critical theoretical insights into mind-wandering and cognitive abilities.

The present study diverges from the original in a couple of ways with one of these differences seeming more likely to explain the discrepant findings. The sample in the original study had an age-range of 18-65; here I restricted it to 18-35. The rationale for this planned difference is that older adults differ from young adults in both WMC and mind-wandering rates such that older adults, on average, have lower WMC than younger adults (e.g., Salthouse, 1990) and mind wander less than younger adults (e.g., McVay, Meier, Touron, & Kane, 2013). In the original study, with a sample size of only 42, a few (or perhaps even one) older adult subjects who scored low on both these measures may have had undue influence on the results. The other point of divergence is that this replication study had subjects complete an operation span task prior to breathing task while in Levinson et al. the breathing task was completed first. Perhaps unlikely, but it is possible that this task-context shift could account for between-study differences.

Conclusion

The current close replication study finds results inconsistent with the original work. Because the replication study was preregistered, had better measurement characteristics (i.e., multiple measures of WMC and larger sample size), provided all data and analysis scripts, it should be granted more evidential weight than the original. Considering the original and the current study together, work using the breath-monitoring task provides no convincing evidence for a positive association between WMC and mind-wandering rate. The best remaining evidence for this positive association in the lab comes from work by Rummel and Boywitt (2014) who found evidence for a significant WMC-related *change* between associations from low to high demand tasks with a nonsignificant negative WMC-mind wandering correlation in a more difficult task (N = 108; r = -.19) and a nonsignificant positive WMC-mind wandering correlation (r = .18) in a less difficult task. Recently, Ju and Lein (2018) conducted a similar study and also found a significant WMC-related change when moving from a lower to a higher demand task, but both WMC-related parameter estimates were *negative*. The evidence for a positive association between WMC and mind-wandering is tenuous (at best). Thus, the results provided here provide support for theories of mind wandering that focus on control (McVay & Kane, 2010) rather than resources (Smallwood, 2010). The current study does provide modest evidence for an association between WMC and self-caught mind-wandering. Because this finding has yet-to-be replicated and the evidence for it is only modest, it is premature to formalize it into a theoretical treatment.

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Footnotes

1. The preregistration was (unintentionally) vague on this point. In the preregistration we stated this planned difference as “Levinson et al. used a community sample for this study who received payment for participation. In this replication, we will use university students who receive credit towards a course requirement.” The eligibility requirements on our online subject pool had the ages of 18-35 listed as the age criterion.
2. In the preregistration, I erroneously listed the transformation of working memory capacity scores as square root transformations. The transformation in Levinson et al. was squaring the scores. Because my intent was to follow Levinson et al., I used the same transformation.

Author Contributions

M.E. Meier developed the study concept and design, performed the data analysis and interpretation, and drafted the manuscript. Adam Lyons is listed on the preregistration but left the university before being able to make a substantial authorial contribution to this project. Although not authors, I wish to acknowledge the help of Kaitlynn Divine, Natalia Torres Wong, Madison Pruitt, Elizabeth Moss, and Adam Lyons for their work in collecting the data for this project. I thank Michael J. Kane for his comments on an earlier version of this manuscript.