- Misinformation often affects judgments even after it has been retracted
- Memory processes are theorized to contribute to the continued influence effect
- A WM capacity latent-variable was associated with continued influence effects
- A STM capacity latent-variable was not associated with continued influence effects

Abstract

Misinformation often affects inferences and judgments even after it has been retracted and discredited. This is known as the continued influence effect. Memory processes have been theorized to contribute to the continued influence effect, and much previous research has focussed on the role of long-term memory processes at the time misinformation is retrieved during inferential reasoning and judgments. Recently, however, experimental research has focussed upon the role of working memory (WM) processes engaged in the updating and integration of information, when the retraction is encoded. From an individual differences perspective, susceptibility to continued influence effects should be predicted by a person's WM abilities, if continued reliance on misinformation is influenced, at least in part, by insufficient integration of the initial misinformation and its subsequent retraction. Consequently, we hypothesized that WM capacity would predict susceptibility to continued influence effects uniquely and more substantially than short-term memory (STM) capacity. Participants (N = 216) completed a continued-influence task, as well as a battery of WM and STM capacity tasks. Based on a latent variable model, our hypothesis was supported (WM capacity: β = -.36, p = .013; STM capacity: β = .22, p = .187). Consequently, we suggest that low WM capacity is a measurable "risk factor" for continued reliance on misinformation.

Keywords: Individual differences; Working memory; Short-term memory; Continued influence effect

Working memory capacity predicts ongoing reliance on misinformation: A latent-variable analysis

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Working memory capacity, short-term memory capacity, and the continued influence effect: A latent-variable analysis

The Continued Influence Effect

When individuals are provided with incorrect information about a certain event or causality, they may still rely upon this misinformation in their inferential reasoning even after the information has been retracted and discredited; this phenomenon is known as the continued influence effect (CIE; Johnson & Seifert, 1994; Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012). For example, participants may be presented with a report, where a sentence will explicitly disconfirm an earlier sentence (e.g., "A driver involved in a car crash was thought to be drunk" is shortly followed by "Police later stated the driver was not drunk"). When participants are subsequently presented with inference statements that they are asked to agree/disagree with (e.g., "The driver should be charged with drink driving"), participants' responses are often significantly biased by the original retracted misinformation, despite this misinformation being explicitly stated to be false.

The CIE makes the spread of misinformation particularly concerning. For example, it is a matter of public concern if misinformation, such as the mythical link between childhood vaccinations and autism, results in adverse public health outcomes, such as decreased vaccination rates and increased rates of vaccine-preventable disease (Larson, Cooper, Eskola, Katz, & Ratzan, 2011). The societal impact of misinformation has been of particular concern since the rise of social media; for example, it has been reported that in the lead-up to the 2016 U.S. Presidential election, the 20 most popular fake news stories got over 1.3 million more Facebook shares, reactions, and comments than the 20 most popular legitimate stories (Silverman, 2016). Thus, it is clear that research into the CIE is timely and important (also see Lewandowsky, Ecker, & Cook, 2017).

Predictors of the CIE

Previous cognition research has theorized that the CIE may result primarily from memory retrieval failure (Ecker, Lewandowsky, & Tang, 2010; Swire, Ecker, & Lewandowsky, 2017). This view assumes that memory entries compete for activation during retrieval, regardless of their validity (Ayers & Reder, 1998). A piece of stored misinformation that can be plausibly situated within a retrieved event may thus be automatically activated by a given retrieval cue. If this occurs in the context of an inferential reasoning task, strategic monitoring processes will be needed to prevent the activated piece of misinformation from influencing the reasoning process. If strategic monitoring fails, however, reliance on misinformation may occur. A related view assumes that retractions lead to the "tagging" of misinformation as incorrect (Ecker, Lewandowsky, Swire, & Chang, 2011; Gilbert, Krull, & Malone, 1990); this retraction tag may not be recovered during memory retrieval (Mayo, Schul, & Burnstein, 2004), allowing the misinformation to unfold its impact without being offset by its retraction.

By contrast, reliance on corrected misinformation may also arise when there is a failure to integrate a piece of misinformation with its retraction and then update one's mental event model accordingly (Kendeou, Walsh, Smith, & O'Brien, 2014; Rapp & Kendeou, 2007; Verschueren, Schaeken, & D'Ydewalle, 2005). In other words, to the extent that processing of the retraction does not result in immediate, adequate updating and revision of the initial, incorrect event model, later reasoning may rely unduly on corrected misinformation. A recent neuroimaging study lends some support to this notion, as the CIE was associated with failure of integration and coherence-building mechanisms mediated by the medial parietal and dorsolateral pre-frontal cortex (Gordon, Brooks, Quadflieg, Ecker, & Lewandowsky, 2017).

If the CIE arises from integration failure during (or immediately after) encoding of the retraction, then a person's ability to integrate conflicting pieces of information, and transform and update the corresponding mental event model accordingly, should be predictive of CIE susceptibility. Arguably, integration and updating processes are core functions of working memory (WM), and thus, a person's WM capacity should predict their susceptibility to the CIE.

Working Memory and Short-Term Memory

WM is a limited capacity system that is responsible for the storage, manipulation, and updating of information required for ongoing cognition (Baddeley & Hitch, 1974; Oberauer, 2009), whereas short-term memory (STM) refers to just the passive storage of information (Atkinson & Shiffrin, 1968). That is, STM could be considered a subcomponent of WM, consistent with Baddeley and Hitch's (1974) model of WM where the slave systems (the phonological loop and the visuospatial sketchpad) are STM constructs, and the central executive is associated with the active manipulation and updating of information (Engle, Tuholski, Laughlin, & Conway, 1999). As such, WM capacity is typically measured with complex-span tasks, whereas more traditional simple-span tasks are thought to measure the storage component only, viz. STM capacity. Engle et al. (1999) and Kane, Bleckley, Conway, and Engle (2001), among others, have suggested that the major difference between WM and STM is that WM requires additional attentional control processes in order for updating, manipulation, and removal of information to occur. Correspondingly, this would help explain why WM capacity often correlates more substantially with executive functions and fluid reasoning, in comparison to STM capacity (Cowan, 2008). Given that a retraction of misinformation requires information integration and the updating of a mental model, it seems plausible that WM capacity may be more strongly associated with the CIE than STM capacity.

Summary and Purpose

In summary, the CIE may arise from a failure of WM processing. That is, misinformation may continue to be relied upon as a result of incomplete or incorrect updating, manipulation, and removal of information from WM, as opposed to mere storage of information. Consequently, the purpose of this investigation was to evaluate the potential differential validity associated with WM capacity and STM capacity as predictors of the CIE. To our knowledge, no studies have yet investigated memory variables as potential predictors of a person's susceptibility to the CIE; this was the aim of the present study. Two hypotheses were proposed. First, it was hypothesized that WM and STM capacity would be related, but to some degree distinct, constructs, as evaluated from a latent variable perspective. Secondly, it was hypothesised that WM capacity would be substantially and uniquely associated with the CIE, in contrast to STM capacity.

Method

Participants

Participants were 285 undergraduate students from the University of Western Australia. Based on various a-priori outlier and minimum-performance criteria (see below), 69 participants were excluded from analysis, yielding a final sample of $N = 216$ participants (139 female, 75 male, 2 other; mean age $M = 22.8$ years, $SD = 7.0$, range 18-58). Participants received course credit for participation.

Materials

The study involved six memory tasks—two verbal tasks and a visuospatial task assessing WM and STM capacity, respectively. Memory tasks were administered online through Inquisit Web Player 5.0.6 (Millisecond Software, Seattle, WA). The misinformation task was administered online via Qualtrics software (Qualtrics, Provo, UT).

WM capacity tasks. The present study used three complex-span tasks—symmetry span (SS), operation span (OS), and reading span (RS)—to measure WM capacity. These paradigms are described in detail by Redick et al. (2012). In the OS and RS tasks, participants were presented with visual sequences of letters (set size 3-7) that needed to be recalled in order at the end of each trial. Each study letter was preceded by either a sentence problem in the RS task (e.g., "Andy was stopped by the policeman because he crossed the yellow heaven.") or a mathematical problem (e.g., "8 × 2 - 8 = 9") in the OS task. For each distractor, participants had to decide whether the sentence made sense or if the proposed math solution was correct. Letter recall was tested by asking participants to select letters from a provided matrix of 10 letters (i.e. the 3-7 targets and the remainder were distractors).

In the SS task, participants were presented visual sequences of red squares (set size 3-7) in a 4 × 4 matrix. Each study item was preceded by a symmetry judgment: participants were shown an abstract black and white image and had to decide whether it was symmetrical along the vertical axis. Serial recall of the squares was tested by asking participants to click on the cells of a 4 × 4 matrix in the order that the study squares had appeared in. For all three WM capacity tasks, partial credit unit scoring was used in line with recommendations by Conway et al. (2005).

STM capacity tasks. Forward digit span and forward letter span were identical tasks with the exception of the presented stimuli. Participants were presented with digit/letter sequences and had to recall them in order by selecting the digits/letters from a circular array of ten digits/letters with the mouse. The initial set size was 3; if a trial was completed correctly, set size increased by 1 on the following trial; if a participant completed consecutive trials of a given set size incorrectly, set size decreased by 1. In total, there were 14 trials, and the greatest achievable set size was 16. The dependent variable extracted from these tasks was the maximum set size a participant correctly recalled.

In the Corsi block task, participants were presented with a screen of nine squares. Squares lit up in a predetermined sequence and participants were then asked to recall it by clicking on the squares in the order they had lit up. Initial set size was 2. There were two trials at each set size, and set size then increased by 1 if at least one of the two trials was completed correctly. If neither of the two trials at a set size were completed correctly, the task was discontinued. In total, there was a maximum of 16 trials, and the maximum set size was 9. The set size of the last correctly recalled sequence was used as the dependent variable.

Misinformation task. Participants read six short fictional news reports (e.g., a report about a wildfire), each consisting of two separate articles of approx. 100 words each (reports were mostly adapted from Ecker, Hogan, & Lewandowsky, 2017). The first article of each report contained a piece of critical information (e.g., the suggestion that "the fire had been deliberately lit"). In half the reports, this critical piece of information was retracted in the second article (e.g., stating that further investigations showed that "the fire had not been caused by arson"). Reading was self-paced but each article was presented for a minimum of 15 seconds before participants could proceed. After encoding the six reports, participants worked on a word sleuth for one minute as a verbal distractor task. Following precedent (e.g., Ecker et al., 2017), the subsequent test phase used a questionnaire measuring participants' memory for and understanding of the reported events. For each report, there were three four-choice fact questions (e.g., "How many hectares of bushland were burnt?" – a. 100,000; b. 25,000; c. 200,000; d. 50,000) and five inference questions. For each report, four of the inference questions were 10-point rating scales (e.g., "Malicious intent contributed to the fire", rated on a scale from 'strongly disagree' to 'strongly agree'). The fifth inference question was a direct four-choice question (e.g., "What do you think was the main cause of the fire?" – a. Accident; b. Extreme heat; c. Arson; d. Lightning).

In order to reduce method variance in the context of an individual differences study, retraction and no-retraction conditions were not counterbalanced across report scenarios, and the order of reports was held constant across participants (all reports are available in the online supplement). The four rating-scale responses were transformed onto 0-1 scales, and the four-choice question was scored as 0 or 1; the mean score from the inference questions, calculated separately for the retraction and no-retraction condition, served as the CIE dependent variable. A greater difference between conditions reflected a stronger impact of the retraction—that is, less reliance on retracted misinformation—and thus a smaller CIE. A single-indicator CIE latent variable was calculated from the internal reliability (Cronbach's alpha = .654) and variance of this difference score (Brown, 2014). This latent variable was multiplied by -1 so that a more negative score denotes a stronger effect of the retraction and thus weaker reliance on the misinformation. Therefore, we expected a significant *negative* association between WM capacity and CIE in the structural equation model.

Procedure

Testing took place in a single session that lasted approximately 1.5 hours. Participants provided informed consent and were fully debriefed at the end of the session. The order of tasks was constant: Corsi, SS, DS, OS, LS, RS, and finally the misinformation task.

Statistical Procedures and Analysis

We first applied two a-priori exclusion criteria. First, participants were removed from analyses if they scored below 70 % correct on the complex-span secondary tasks (e.g., the OS math equations); this criterion ensured that participants did not exclusively focus on the primary task, effectively turning the WM task into a STM task. While Unsworth, Heitz, Schrock, and Engle (2005) and Engle et al. (1999) used 85 % as a cut-off for the complex-span secondary tasks, we chose a more lenient criterion that still required participants to perform well above chance but limited the number of exclusions. Second, participants were

also excluded if they failed to correctly answer at least one fact question regarding the reports in the misinformation task, to ensure participants had adequately engaged with the materials; recall-based exclusion criteria are common in misinformation research (e.g., Ecker et al., 2017). Overall, this resulted in 66 participants being excluded. All observed scores displayed a satisfactory level of normality (skew < |1.50|). Additionally, a total of 16 scores across the seven observed variables were identified as outliers, based on the inter-quartile range rule with a 3.0 multiplier. Those 16 values were winsorized (increased or reduced to the next lowest/highest value not suspected to be an outlier; Tukey, 1962). Three multivariate outliers were identified when examining Mahalanobis distances (critical value of $p < .001$); these cases were removed from all analyses.

In the following, latent variables associated with STM and WM capacity will be referred to as STMC and WMC, respectively. In order to evaluate the STMC and WMC latent variables for dimensional distinctness, a single-factor model was compared against a correlated two-factor (STMC and WMC) model[1]. Additionally, dimensional distinctness was considered indicated if the STMC and WMC 95% upper-bound correlation confidence interval did not intersect with 1.0. In order to evaluate the potential influence of STMC and WMC on CIE, the CIE latent variable was regressed onto the STMC and WMC latent variables. The standardized beta weights associated with the STMC and WMC latent variables were of key interest.

Based on guidelines summarized by Schweizer (2010), the CFA/SEM models were evaluated to be well-fitting according to the following criteria: Comparative fit index (CFI) ≥ .950; Tucker-Lewis index (TLI) ≥ .950; standardized SRMR < .08; and the root mean square error of approximation (RMSEA) < .06. The 90 % Cis of the RMSEA are also reported. The Bayesian information criterion (BIC) was used to compare models. Smaller BIC values indicate better fitting models. For thoroughness, the implied model chi-square

statistics are also reported. All models were tested in Amos 24 (Arbuckle, 2016) via maximum likelihood estimation, although the standard errors and confidence intervals were estimated via bias-corrected bootstrapping (with 2,000 replications), in order to help ensure robustness to any deviations from normality.

Results

Descriptive Statistics

Descriptive statistics and correlations between variables are presented in Table 1. A manipulation check on the misinformation scenarios was conducted by calculating average no-retraction (M = -.65, SD = .17) and retraction (M = -.54, SD = .25) inference scores for each participant. There was a significant difference between conditions in the expected direction, $t(217) = 7.00$, $p < .001$, Cohen's d = .49.

Latent Variable Analyses

The single-factor STMC/WMC model was found to be associated with unacceptable model-fit, $\chi^2(8) = 38.58$, $p < .001$, CFI = .898, TLI = .809 $RMSEA$ = .112 (90 % CI = .093 - .177), $SRMR$ = .056, BIC = 108.45. By contrast, the STMC and WMC correlated-two factor model was found to be associated with excellent model fit, $\chi^2(7) = 9.22$, p = .237, CFI = .993, TLI = .984, $RMSEA$ = .038 (90 % CI = .000 - .098), $SRMR$ = .017, BIC = 84.48. Furthermore, the correlated two-factor model fit better than the single-factor model, $\Delta\chi^2(1) = 29.36$, $p < .001$, ΔBIC = -23.97. The STMC and WMC latent-variable correlation was estimated at r = .70 (95 % CI = .57 – .83). Thus, there was consistent evidence for dimensional distinctness of STMC and WMC in this sample.

Next, the multiple regression latent-variable model was tested, with STMC and WMC as predictors of CIE. The model was found to be associated with excellent model fit, $\chi^2(11) = 14.91$, p = .187, CFI = .987, TLI = .976, $RMSEA$ = .041 (90 % CI = .000 - .088), $SRMR$ = .029. As can be seen in Figure 1, STMC was associated with a non-significant

standardized beta weight, ß = .22, p = .187, 95 % CI = -.51 – .14. By contrast, WMC was associated with a significant standardized beta weight, ß = -.36, p = .013, 95 % CI = .08 – .74. The model yielded a R^2 = .07, p = .018 (95 % CI = .01 – .20). Thus, 7% of the true score variance in CIE was accounted by the model that included STMC and WMC as predictors of CIE.

As Corsi and symmetry span tasks had non-significant/low correlations with the other measures in the study, we conducted further latent-variable analyses without those two tasks. The results of these analyses were extremely similar to the original results: A two-factor CFA model was preferred to a one-factor model (WMC and STMC significantly correlated, r = .69, 95 % CI = .55 - .84). In the SEM, the WMC-CIE regression weight was significant (ß = -.33, p = .006, 95 % CI = .12 – .66), but the STMC-CIE regression weight was not (ß = .20, p = .134, 95 % CI = -.52 – .05). The model yielded a R^2 = .06, p = .003 (95 % CI = .01 – .15). Additionally, the results were not affected by including non-winsorized outliers and multivariate outliers.

Discussion

The current study aimed to investigate whether susceptibility to the continued influence effect of misinformation (CIE) could be predicted by a person's WM capacity. It was hypothesised that (1) WM and STM capacity are related yet separable constructs (e.g., Engle et al., 1999), and that (2) WM but not STM capacity would be related to the CIE. Both of these hypotheses were supported by the results.

The large, positive correlation between the STMC and WMC latent variables (r = .70) supported the first hypothesis. Additionally, the upper-bound 95 % confidence associated with the latent-variable correlation was comfortably less than 1.0 (i.e., .83). These results corroborate the body of research that has previously found moderate to strong associations between STM and WM capacity (Engle et al., 1999), although we acknowledge the

difficulties with generating clear conclusions about dimensional distinctness with correlated two-factor models (Gignac & Kretzschmar, 2017). We note briefly that the strong relation has been suggested to be due to the temporary storage processes common to both constructs (Colom, Rebollo, Abad, & Shih, 2006). We acknowledge that the grouping of STM and WM tasks in our modeling was theoretically driven, rather than exclusively empirically driven.

Our finding that WM capacity uniquely predicted susceptibility to the CIE suggests that the CIE may arise, at least partly, from a failure of integration, manipulation, and updating processes in WM, when the retraction is processed (Ecker et al., 2017; Gordon et al., 2017; Kendeou et al., 2014). Limited WM capacity will limit a person's ability to concurrently activate and integrate conflicting pieces of information, and then update and revise the corresponding event model accordingly. This retraction-triggered integration is akin to routine situation-model updating during reading comprehension (e.g., Bower & Morrow, 1990). Consistent with this, previous research has found that WM capacity is a strong predictor of language comprehension (Daneman & Merikle, 1996) and reading ability (Daneman & Carpenter, 1980). Interestingly, it has been reported recently that individual differences in vocabulary were related to the CIE ($\beta = .14$; De keersmaecker & Roets, 2017). Specifically, individuals with lower levels of crystallized intelligence (i.e., vocabulary) were found to rely more heavily on old and incorrect information, even after it had been explicitly stated to be false. Given the close associations between WM and both fluid and crystallized intelligence (e.g., Friedman et al., 2006), it would be useful to determine whether fluid and/or crystallized intelligence are uniquely associated with the CIE, independently of the effects of WMC.

An alternative to our preferred explanation—that low WM capacity is associated with difficulties integrating a retraction with an existing mental model—is that the CIE may emerge at the retrieval stage, and that people with low WM capacity may be less likely to

retrieve the most relevant pieces of information into their WM, resulting in a higher likelihood of relying on familiar misinformation (see Fazio, Brashier, Payne, & Marsh, 2015; Schwarz, Newman, & Leach, 2016; Swire et al., 2017). In other words, while we argue that the present results support the model-integration account of the CIE, they do not rule out the retrieval-failure account.

We note that only the *capacity* of WM was measured in the current study. Measures of more specifically relevant WM functions might show a stronger relation to the CIE. For example, some research has suggested that the removal of outdated information is a core process involved in WM updating (Ecker, Lewandowsky, & Oberauer, 2014; Ecker, Oberauer, & Lewandowsky, 2014; Oberauer, Lewandowsky, Farrell, Jarrold, & Greaves, 2012; Singh, Gignac, Brydges, & Ecker, 2018), and that individuals with lower WM capacity may have difficulty suppressing inaccurate information in WM (Hasher & Zacks, 1988). Thus, future research could test whether updating-efficiency or inhibition measures could add additional predictive power to the model.

Limitations

While the current results provide evidence of a link between WM capacity and susceptibility to the CIE, the observed score association was quite weak. We acknowledge that our sample consisted entirely of undergraduates, so there would have been some range restriction in cognitive ability. Consequently, the reported effects of STM and WM capacity on the CIE may have been attenuated. However, both STM and WM capacity were likely range-restricted to the same degree. It follows that the pattern of effects reported in this investigation would not likely be different in a more heterogeneous sample. Naturally, replication on a general community sample would be useful.

Another limitation of the current study is the bias towards verbal memory tests (two verbal and only one visuospatial test for each memory construct). This bias is a likely

explanation for why the Corsi task loaded relatively weakly onto the STMC factor in each of the analyses. Future research could consider administering an even number of verbal and visuospatial memory tasks in an attempt to minimise this bias. It should be noted, however, that neither of the visuospatial memory measures significantly correlated with the CIE measure, presumably because the misinformation task was an entirely verbal task, and verbal and visuospatial memory processes are relatively independent (e.g., Friedman & Miyake, 2000; Shah & Miyake, 1996; but see Oberauer, Süß, Wilhelm, & Wittman, 2003). Thus, our conclusion that WM capacity predicts susceptibility to the CIE may have to be refined, and it may be that only *verbal* WM capacity predicts susceptibility to the CIE.

Conclusion

The consequences of failing to adjust beliefs on the basis of new information can be seriously harmful socially. The results of this investigation suggest that a dimension that cannot be enhanced easily (WMC) may play an important role in the CIE. Thus, people with reduced WM skills (e.g., the elderly; Braver & West, 2008; Salthouse, 1994) will be more susceptible to the impact of misinformation. Beyond cognitive abilities, it remains to be determined what dimensions impact the CIE. Ultimately, a more complete understanding of the predictors of the CIE may help facilitate approaches to curtail its pernicious influence.

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Footnote

[1] The residual variances of the Corsi and symmetry span tasks were free to correlate as they were the only two spatial memory tasks administered. Removing this correlation did not affect the STMC-WMC correlation in any analysis.

Table 1

Descriptive statistics and correlations of memory and misinformation tasks

Task	1.	2.	3.	4.	5.	6.	7.	*M*	*SD*	Skew	Reliability
1. Operation Span	-	.72***	.60***	.13	.49***	.57***	-.24***	.81	.15	-1.21	.702
2. Reading Span	.56***	-	.46***	.10	.42***	.48***	-.19**	.74	.20	-1.23	.858
3. Symmetry Span	.38***	.32***	-	.59***	.24***	.52***	.03	.56	.18	-0.29	.562
4. Corsi	.09	.08	.37***	-	.06	.21**	-.10	6.38	1.12	0.15	.689
5. Digit Span	.35***	.33***	.15*	.04	-	.87***	-.04	7.61	1.30	0.74	.717
6. Letter Span	.39***	.36***	.32***	.14*	.60***	-	.03	7.00	1.35	1.07	.669
7. CIE Difference	-.16*	-.14*	.02	-.07	-.03	-.02	-	-.34	.72	-0.62	.654

Note. $N = 216$; correlations below the main diagonal are observed correlations; correlations above the main diagonal have been attenuated for imperfect reliability. * $p < .05$, ** $p < .01$, *** $p < .001$.

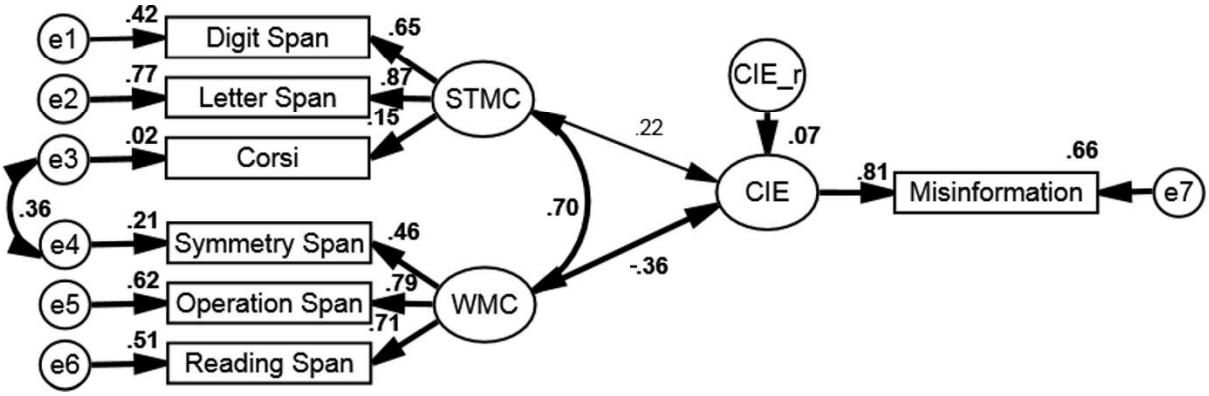

Figure 1. Structural equation model of working memory capacity (WMC) and short-term memory capacity (STMC) predicting the continued influence effect (CIE). Straight lines with single arrows are regression paths. Curved lines with double arrows are correlations. Emboldened lines and values indicate statistically significant regression/correlation coefficients ($p < .05$). The value above the CIE factor is the squared multiple correlation.

Online Supplement

Scenario NR1 (Airplane emergency landing)

Article 1.
Passengers on a commercial flight en route to Los Angeles received a terrible fright yesterday as their plane required an emergency landing. Peter Fern, the pilot of the aircraft, made the decision to land after he was having difficulties controlling the plane. The Federal Aviation Administration believes the pilot made the right decision, and attributed difficulties controlling the aircraft to a fault caused by extreme weather conditions. The aircraft was able to make a safe landing at Kansas City airport, and all 350 passengers on board were evacuated without problem. The aircraft involved was an A380 Airbus, the largest passenger airplane in the world.

Article 2.
Passengers on a commercial flight that had to make an emergency landing at Kansas City airport were forced to stay overnight while the airline arranged a suitable replacement aircraft. Marie Scott, a passenger on the flight, told reporters of her ordeal: "It was horrible, all loose items were getting thrown around the cabin, and the seatbelt was hardly containing me. I'm glad I'm safe, but I just really want to go home to my family now." Meanwhile, the airport provided passengers with accommodation and complimentary food on behalf of the airline. In the morning, a replacement aircraft had been organized and passengers expressed their gratitude to the airline for managing the situation professionally.

Questions regarding the 'airplane emergency landing' article.
F1. What airport did the airplane land at? (a. Kansas City; b. Denver; c. Washington D.C.; d. Seattle)
F2. How many passengers were on board? (a. 100; b. 150; c. 350; d. 500)
F3. What type of aircraft was involved? (a. Boeing 747; b. Airbus A380; c. Boeing 787; d. Airbus A319)
I1. When planning flight routes, more attention should be paid to weather forecasts. (0-10 scale from "Completely disagree" to "Completely agree")
I2. U.S. guidelines for flying in bad weather should be reviewed.
I3. Bad weather contributed to the emergency landing.
I4. It should be investigated which plane control systems were affected by the weather.
I5. What do you think was the main cause of the incident? (a. Bad weather; b. Lack of servicing; c. Foul play; d. Pilot error)

Scenario R1 (Bushfire)

Article 1.
Firefighters in rural Victoria have been battling a bushfire that raged out of control in the state's North overnight. The bushfire came dangerously close to homes in the town of Euroa, but it is believed that no damage was caused to property. David Karle of the Country Fire Authority (CFA) indicated that authorities were looking into the cause of the fire, with initial evidence suggesting that the fire had been deliberately lit. Emergency services were still working tirelessly this morning to extinguish the flames, but were confident that the fire was unlikely to pose any further threat to local communities. The suspected burn area is estimated to be roughly 50,000 hectares.

Article 2.
After working throughout the day, firefighters have managed to bring a bushfire in Northern Victoria under control. There have been no reported casualties or damage to property, with most land damage occurring in rural fringe areas and nearby forest reserves. After further investigation, authorities believed the fire had not been caused by arson. When speaking to the media, Eoroa resident Casey Haas expressed her relief that no one had been harmed by the fire, and said she felt lucky that they had avoided disaster. Even so, she appealed to residents of the community to work together to ensure they were prepared for disaster if it ever struck again.

Questions regarding the 'bushfire' article.
F1. Where did the bushfire occur? (a. Shepparton, b. Euroa, c. Benalla, d. Kyneton)
F2. What was local resident Casey relieved about? (a. That no one had been harmed; b. That her house had not been affected; c. That her pets had survived; d. That rain had set in)
F3. How many hectares of bushland were burnt? (a. 100,000; b. 25,000; c. 200,000; d. 50,000)
I1. Local residents need to look out for suspicious behaviour.
I2. There should be a call for local authorities to spend more resources to prevent arson.
OR
Police should investigate the circumstances of the fire.
I3. Malicious intent contributed to the fire.
I4. The person responsible for the bushfire should be identified and punished.
I5. What do you think was the main cause of the fire? (a. Accident; b. Extreme heat; c. Arson; d. Lightning)

Scenario NR2 (Drug dealer's death)

Article 1.
The death of a notorious drug dealer, known on the street as 'Coach', is being treated as suspicious. He had been under investigation for several months by police regarding his alleged involvement in the trade of methamphetamines. At this stage of the investigation, authorities believe the death was the result of an assault in what appears to have been a drug deal gone wrong, and various members of the local drug scene are being investigated. A neighbour discovered the man in his Frankston home during the early hours of Saturday morning. The man had been dead for several hours before he was found. Sergeant Barry Wade from the Victorian Police Force has asked anybody who has witnessed any suspicious behaviour in the area to contact authorities.

Article 2.
A clandestine drug lab has been discovered in the home of a drug dealer who died last week at his Frankston home. Methamphetamines and cash, as well as a surveillance camera system, have been seized from the property. Some members of the local community have been sighted at the drug-dealer's home leaving flowers and paying their respect. The funeral is scheduled for tomorrow afternoon, and will be attended by friends and family of the deceased under police observation. A spokesperson for the family said they were extremely upset by their family member's death.

Questions regarding the 'drug dealer's death' article.
F1. What was the nickname of the drug dealer? (a. Priest; b. Shrink; c. Grandpa; d. Coach)
F2. Who discovered the body? (a. Family; b. Police; c. Neighbour; d. Postman)
F3. What kind of drug did police find on the property? (a. LSD; b. Methamphetamine; c. Crack; d. Ecstasy)
I1. The family of the drug dealer is likely to seek revenge.
I2. Police should investigate the circumstances of the drug dealer's death.
I3. It would be appropriate for someone to be jailed as a result of the drug dealer's death.
I4. The person responsible for the death should be identified and punished.
I5. What do you think was the cause of death? (a. Heart attack; b. Suicide; c. Assault; d. Accident)

Scenario R2 (Woman's collapse)

Article 1.
A 21-year-old woman has been taken to St. Mary's hospital after losing consciousness whilst out partying at the Cable nightclub in London in the early hours of the morning. A friend of the woman said she had complained of hallucinations and nausea not long before falling unconscious. The woman's blood pressure and heart rate have stabilized and doctors believe the woman's symptoms were the result of her drink getting spiked. A recent series of drink-spiking incidents at local nightclubs has led to renewed calls for the introduction of a bottled-drinks-only policy. The incident comes as a reminder to party-goers to be careful with their drinks and always stay with friends.

Article 2.
A woman who fell unconscious while partying at a London nightclub has remained in hospital. The woman was out celebrating with friends after graduating from the Regent Fashion Academy when she collapsed and required medical attention. Hospital doctors have now ruled out drink-spiking as the cause of her symptoms. Further tests were being conducted, but the woman was due to be released from hospital later today. The woman's brother stated the family was relieved that she was recovering well, and praised her friends, saying it was their timely aid that saved her from further harm. The woman herself has no memory of the incident.

Questions regarding the 'woman's collapse' article.
F1. What nightclub was the woman partying at? (a. Loft; b. Fabric; c. Cable; d. Cargo)
F2. In what city did the incident occur? (a. London; b. Melbourne; c. New York; d. Munich)
F3. Where did the woman study? (a. art academy; b. dance academy; c. science academy; d. fashion academy)
I1. The affected nightclub should immediately introduce a 'bottled drinks only' policy.
I2. Police should investigate the circumstances of the woman's collapse.
I3. A criminal act occurred at the nightclub.
I4. The person responsible for the incident should be identified and punished.
I5. What do you think was the cause of the woman's collapse? (a. Dehydration; b. Drink spiking; c. Alcohol; d. A medical condition)

Scenario NR3 (Train derailment)

Article 1.
A commuter train was derailed earlier this morning near the town of Metz in northern France. The accident occurred around 8.30am during the busy commuting period. Initial reports suggest that as many as twenty passengers may have lost their lives, and more than 100 people sustained injuries. It appears the train was travelling at excessive speed around a sharp bend of the track. Emergency services were called in from neighbouring Germany to assist with the recovery efforts. The injured were brought to local hospitals, and he train line between Metz and Thionville has been closed until further notice. Replacement buses will be available, but commuters have been urged to seek alternative arrangements if possible.

Article 2.
The official death toll of the train derailment in northern France has now been put at 19. Among the deceased were French, German, and Swiss nationals, including the CEO of French food manufacturer Carmigel. A passenger explained that there had been no warning signs: “All of a sudden things and people were flying through the air. There was this moment of silence and weightlessness before a horrible bang and the sound of screeching metal. It was terrifying.” Closer analysis revealed that there had been a number of near-miss incidents on the affected section of tracks in recent years. The line will remain closed for a number of days while the site is cleared.

Questions regarding the ‘train derailment’ article.
F1. Near what town did the derailment happen? (a. Metz; b. Nancy; c. Strasbourg; d. Reims)
F2. What was the death toll? (a. 29; b. 19; c. 3; d. 100)
F3. What did the company of the killed CEO manufacture? (a. tools; b. cars; c. electronics; d. food)
I1. The driver of the train should be charged with misconduct.
I2. The French Railway (SNCF) should investigate the driver’s training and conduct history.
I3. Negligence contributed to the derailment.
I4. An automatic speed-limiting system on the train would have prevented the accident.
I5. What do you think was the cause of the derailment? (a. Collision; b. Mechanical failure; c. Tampering with the track; d. Speeding)

Scenario R3 (Fish kill)

Article 1.
The Freemont Water Department has been forced to shut down intake from its main water supply, the Denroy River, due to large scale fish deaths in the waterway. The department supplies water to the entire Shelby region. It is believed that the fish deaths were due to contamination caused by dumping of chemical waste by a riverside pharmaceutical company, in violation of the Missouri Clean Water Act. The water department stated it remained committed to ensuring that customers can be confident that their water supply is of the purest quality. Authorities have begun clearing the dead fish from the waterway.

Article 2.
Authorities have been given the all-clear to continue water intake from the Denroy River, after operations had ceased for 5 days due to a fish kill in the waterway. The incident had residents concerned and occupied local news headlines all week. Tests by both the local water department and an independent agency have now disconfirmed a chemical spill as the cause. The water-intake shutdown was a critical issue for the region, as recent draught periods have resulted in record low storage levels. Local fisherman Trent Wilson called the fish kill a "terrible sight and a blow for local businesses." A spokesperson of the water department has assured customers that the local drinking water is as safe as it has ever been.

Questions regarding the 'fish kill' article.
F1. What water department was involved? (a. Greenacre; b. Wentworth; c. Patterson; d. Freemont)
F2. What is the name of the river that the water supply comes from? (a. Harding; b. Denroy; c. Frederick; d. Morgan)
F3. How many days was intake from the water supply shut down for? (a. 1; b. 9; c. 5; d. 17)
I1. The riverside pharmaceutical company should start an internal investigation and review their procedures.
I2. Environmental control measures in riverside industrial areas in Missouri should be tightened.
I3. Chemical contamination contributed to the incident.
I4. The riverside pharmaceutical company should be fined.
I5. What do you think was the cause of the fish deaths? (a. Chemical spill; b. Water temperature; c. Virus; d. Algae bloom)