

Romantic partners' working memory capacity facilitates relationship problem resolution through recollection of problem-relevant information

By: [Levi R. Baker](#), [Michael J. Kane](#), and V. Michelle Russell

Baker, L.R., Kane, M.J., & Russell, V.M. (2020). Romantic partners' working memory capacity facilitates relationship problem resolution through recollection of problem-relevant information. *Journal of Experimental Psychology: General*, 149, 580-584.
<http://dx.doi.org/10.1037/xge0000659>

©American Psychological Association, 2019. This paper is not the copy of record and may not exactly replicate the authoritative document published in the APA journal. Please do not copy or cite without author's permission. The final article is available, upon publication, at: <http://dx.doi.org/10.1037/xge0000659>

Abstract:

Intimates often discuss the causes of, and solutions to, their relationship problems with their partners, and this information can shape partners' behavior and thus facilitate problem resolution. Partners' ability to encode and later recall such discussions should lead to greater declines in the severity of those problems. This brief report presents the results from a broader longitudinal study in which newlywed couples completed tasks assessing their working memory capacity (WMC), engaged in problem-solving discussions, recalled those discussions after a short delay, and then reported the severity of the problems discussed over the course of a year. Greater WMC among partners was associated with greater declines in the severity of a relationship problem, mediated by partners' recall of the discussion of that problem, suggesting that WMC facilitated the long-term memory encoding of the problem discussion. This study is among the first to suggest that individual differences in basic cognitive abilities may affect conversation processing and recall, and thereby close relationships.

Keywords: conflict | romantic relationships | working memory capacity | problem solving

Article:

Nearly everyone encounters problems within their relationships at some point (e.g., McGonagle, Kessler, & Schilling, 1992); for example, many couples struggle with finances, sexual issues, communication, household management, or jealousy (Storaasli & Markman, 1990). Given that resolving such problems is critical for achieving satisfying and stable relationships (e.g., McNulty & Russell, 2010), intimates often attempt to resolve their problems by discussing them with their partners. For example, they might provide advice or suggestions, demand behavioral changes, blame their partner for the problem, provide information about the problem, identify obstacles preventing their resolution, bolster a partner's confidence to change problematic behavior, or provide emotional support to a partner who is overwhelmed. Although these behaviors differ in meaningful ways, intimates typically engage in them to provide their partners with the information and motivation needed to behave in ways that alleviate those problems (Baker & McNulty, 2015; Overall & McNulty, 2017). After problem-relevant

communication is expressed, however, partners' future recollection of this information should determine whether it actually shapes future problem-solving behavior. For example, recalling that a partner said that the checking account was low may reduce future frivolous spending, or recalling a partner's sexual preferences might prompt behaviors that reduce that partner's sexual dissatisfaction.

Working memory capacity (WMC)—the ability to actively maintain information during ongoing processing and despite distractions (Conway et al., 2005)—should influence whether people later recall partners' problem-relevant communication. Like classroom note-taking (e.g., Kiewra & Benton, 1988), discussions about relationship problems challenge WMC. They require not only processing and encoding what the partner is saying, but also formulating responses, generating independent arguments, regulating emotions, and avoiding other distractions (e.g., crying offspring, background noise from the TV). Given that WMC facilitates encoding of information into long-term memory (e.g., Unsworth, 2016), WMC should determine how well people later recall partners' problem-relevant communication and thus should predict declines in problem severity over time. Nevertheless, research has yet to examine the implications of individual differences in basic cognitive abilities, such as WMC, for close relationships (cf. self-control; Baker & Baumeister, 2017).

This report presents results from one longitudinal study of newlywed couples, in which spouses completed tasks assessing WMC, engaged in problem-solving discussions, recalled their partners' statements during those discussions after a brief delay, and reported the severity of those problems three times over the subsequent year. We hypothesized that (a) intimates would report greater declines in problem severity to the extent that their partners possessed greater WMC, and (b) this association would emerge due to those partners recalling more information from problem-solving discussions.

Method

Additional details (e.g., all measures, justification of the population, power analyses) can be found in the online supplemental materials. All procedures were approved by the Institutional Review Board at the University of North Carolina at Greensboro.

Participants

Participants represented all 101 newlywed couples (93 heterosexual couples, seven lesbian couples, one gay couple) participating in a broader longitudinal study of marriage. Couples were eligible if they (a) had been married less than 3 months, (b) were at least 18 years old, and (c) spoke English and had completed at least 10 years of education (to ensure comprehension of questionnaires). This sample size was the maximum number of couples we had the funds to recruit.

At baseline, participants were, on average, 32.35 years old ($SD = 8.71$) with 16.94 years ($SD = 2.83$) of education. One hundred twenty-nine (64%) were White or Caucasian, 55 (27%) were Black or African American, four (2%) were Asian, three (2%) were Hispanic and/or Latino/a, and the remaining 11 (5%) were another or two or more ethnicities.

Procedure

At baseline, couples completed online questionnaires that included measures of demographics, as well as constructs unrelated to the current hypotheses (e.g., sexual behavior). Couples then attended a laboratory session where they first completed tasks assessing their WMC in separate rooms. Next, couples participated jointly in two problem-solving discussions. Each spouse identified a problem with their relationship that could be resolved through changes in their partner's behavior. Immediately before and after each discussion, participants reported the severity of the problem they discussed. Couples then participated in two 8-min video-recorded discussions in which they were left alone to "work towards some resolution to the problem." Primary analyses examined whether changes in the severity of the problem each participant chose were associated with their partners' WMC for two reasons: (a) the benefits of WMC should emerge when recollection of problem-related information will prompt behavioral changes that resolve problems, and (b) participants tend to select problems that require greater behavioral changes from their partners than from themselves (see Baker & McNulty, 2011). After each discussion, spouses returned to their separate rooms and were audio recorded recalling and verbally summarizing their partners' statements from those discussions. Couples were paid \$100 for their participation at baseline.

Four and eight months after baseline sessions, couples were emailed a set of questionnaires, in which they were reminded of the problems they discussed and reported the current severity of that problem. These questionnaires were completed online using Qualtrics survey software. Couples were paid \$25 for each subsequent assessment.

Measures

Partners' WMC

Participants completed two WMC tasks developed by Foster and colleagues (2015). Both required participants to complete distractor tasks (e.g., arithmetic problems) between presentations of items that they were instructed to remember (e.g., letters). To-be-remembered items were presented in sets that varied from two to seven items, which participants were asked to recall in serial order at the end of each set. The first task (operation span) presented to-be-remember letters that were interpolated with a distractor task to solve arithmetic problems. We modified the task by replacing arithmetic problems that contained division with similar problems that contained multiplication because pilot testing indicated that many participants could not complete problems involving division, even during the practice block with small sets. The second task (symmetry span) required participants to recall the locations of sequentially presented red squares in a 4×4 grid that were interpolated with a distractor task to judge whether or not a black-and-white pattern was symmetrical on its vertical axis. Per recommendations by Conway and colleagues (2005), both tasks were scored by counting the total number of items each participant remembered (i.e., partial scores). Participants who repeatedly failed the distractor tasks (i.e., > 1.5 SDs above the mean in errors) were excluded from all analyses ($n = 4$; see the online supplemental materials for equivalent results following alternative exclusion rules) to ensure participants were distracted and WMC was assessed

successfully (see Conway et al., 2005). Scores on both tasks were standardized and averaged ($r = .51$) to create an overall index of WMC (see Conway et al., 2005).

Partners' discussion recall

We predicted that WMC would facilitate better encoding of problem-relevant communication, which would facilitate long-term recall and thus problem resolution. Accordingly, to assess the extent to which such information was encoded, we assessed participants' recall of their partners' problem-relevant communication after they completed each discussion; such immediate recall is highly predictive of recall delayed over longer periods of time (e.g., $r_s > .70$; Benjamin, Bjork, & Schwartz, 1998; Fine et al., 2008; Gates, 1918; Jonsson, Wiklund-Hörnqvist, Nyroos, & Börjesson, 2014). Specifically, participants returned to separate rooms after each discussion and were audio recorded verbally summarizing their partner's statements during that discussion. Two independent coders later rated these audio recordings for the extent to which participants recalled relevant information from the discussion. To do so, coders first watched each video-recorded conversation twice and created a detailed summary of statements made by each participant during that conversation. Immediately afterward, coders then listened to participants' summaries of their partners' statements and rated each summary on a combination of the frequency and detail that the participant recalled on a scale from 1 (*participants recalled no statements, provided no detail*) to 7 (*participants recalled all relevant statements, provided thorough detail*). Half of the discussions were coded by both raters; coders were reliable (intraclass correlation coefficient = .75).

Problem severity

Before and after each conversation, participants rated the severity of each problem they discussed on a scale from 1 (*not at all*) to 7 (*extremely*). Further, 4 months and 8 months after their laboratory session, participants were reminded of their discussion topics and used the same scale to report the current severity of the problem.

Alternative mechanisms

To examine whether other factors associated with WMC accounted for any effects of WMC, we assessed individual differences in distress tolerance, emotion regulation, self-efficacy, motivation to resolve problems, self-control, and the progress that intimates made during problem-solving discussions (see the online supplemental materials).

Results

Descriptive Statistics and Preliminary Analyses

Descriptive statistics and correlations are presented in Table 1. Men and women did not differ in their ratings of the severity of the problems they chose prior to, $t(200) = 0.46, p = .646, r = .03$, or immediately after, $t(200) = -0.29, p = .770, r = .02$, their discussions, recall of information from the discussions of the problems that their partners chose, $t(200) = 1.61, p = .109, r = .11$, or in their assessment of the progress made in resolving problems they chose, $t(200) = -0.49, p =$

.627, $r = .03$. Nevertheless, consistent with previous research with these tasks (e.g., Redick et al., 2012), men's WMC was greater than women's, $t(196) = 2.06$, $p = .041$, $r = .15$.

Table 1. Descriptive Statistics and Correlations Among Variables

Variable	1	2	3	4	<i>M</i>	<i>SD</i>
1. Working memory	.01	.12	.11	.23*	-.17	.87
2. Prediscussion severity	-.09	.10^a	.70**	-.06	3.57	1.82
3. Postdiscussion severity	-.01	.52**	.03^a	-.04	3.40	1.76
4. Discussion recall	.10	-.06	-.03	-.01^a	4.12	1.43
<i>M</i>	.09	3.44	3.43	4.45		
<i>SD</i>	.91	1.56	1.61	1.49		

Note. Descriptive statistics and correlations are presented above the diagonal for women and below the diagonal for men; correlations between spouses appear on the diagonal in bold.

^a Associations are based on reports of different topics (i.e., the association between Partner A's assessment of the problem selected by Partner A, and Partner B's assessment of the problem selected by Partner B).

* $p < .05$. ** $p < .01$.

Before examining whether WMC predicted changes in problem severity, we conducted a growth curve analysis (Bryk & Raudenbush, 1987) with a three-level model using the HLM 7.03 computer program to estimate the average trajectory of problem severity from immediately after the discussion through the 4-month follow-up to the 8-month follow-up. In the first level of this model, participants' reports of the severity of the problem they chose to discuss were regressed onto the time of assessment and a randomly varying intercept. The nonindependence of repeated assessments was controlled in the second level of the model with a randomly varying intercept and the nonindependence of couples' data was controlled in the third level of the model with a randomly varying intercept. Results indicated that problem severity declined over time, $t(244) = -4.54$, $p < .001$, $r = .28$.

Was Partners' WMC Associated With Changes in Problem Severity?

To address our primary prediction that changes in the severity of the problem that each participant chose would be associated with their partners' WMC, we conducted a similar growth curve analysis that additionally regressed partners' WMC scores onto both the intercept and the time of assessment. Although it was not our original intention to control for gender, the observed gender difference in WMC encouraged us to include gender as a covariate (results without the covariate appear below). Although partners' WMC was not significantly associated with the intercept (i.e., severity immediately after discussion), $t(95) = 0.26$, $p = .792$, $r = .03$, it was associated with greater declines in problem severity over the following 8 months, $t(242) = -2.51$, $p = .013$, $r = .16$. Figure 1 depicts the predicted problem severity at each time point for intimates whose partners were 1 *SD* above and below the WMC mean. Supplemental analyses indicated that partners' WMC was not associated with prediscussion ratings of problem severity, $t(95) = -0.78$, $p = .439$, $r = .08$, and partners' WMC continued to significantly predict declines in problem severity after controlling for prediscussion severity, $t(241) = -2.39$, $p = .018$, $r = .15$, suggesting that intimates whose partners possessed greater WMC did not simply select easier-to-resolve problems than did intimates whose partners were lower in WMC. Finally, partners' WMC remained significantly associated with declines in problem severity after controlling for participants' own WMC, $t(241) = -2.52$, $p = .012$, $r = .16$, and when gender was not included as a covariate, $t(243) = -2.15$, $p = .033$, $r = .14$.

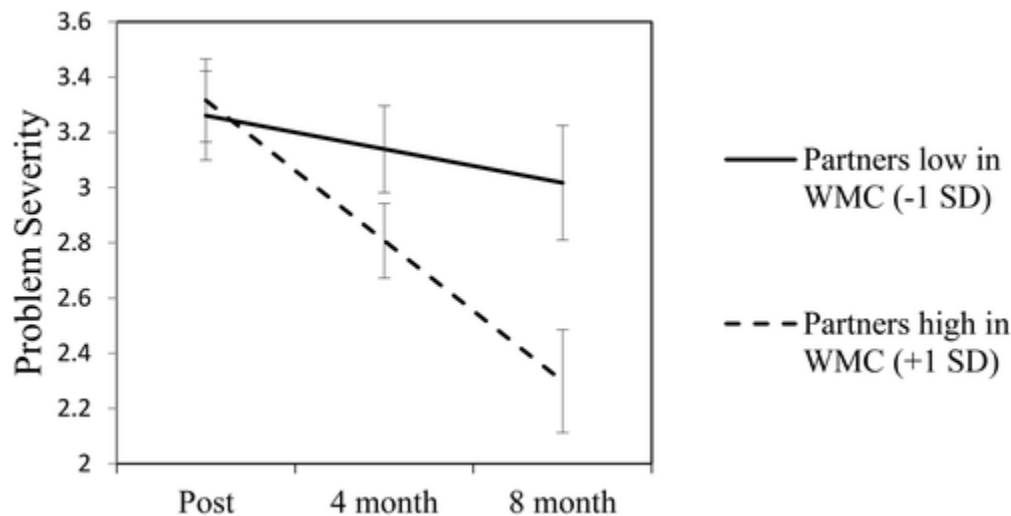


Figure 1. Trajectories of problem severity based on partners' working memory capacity (WMC).

Did Partners' Memory of Problem-Relevant Communication Mediate This Association?

Next, we tested whether the association between partners' WMC and changes in problem severity was mediated by those partners' immediate memory of problem-relevant information exchanged during the discussion of that problem. To do so, we conducted two additional sets of analyses to compute asymmetric confidence intervals for the distribution of the product of the mediated effect (MacKinnon, Fritz, Williams, & Lockwood, 2007), which improves power to detect valid indirect effects versus other methods (e.g., Monte Carlo simulations, bootstrap resampling; see MacKinnon, Lockwood, & Williams, 2004). First, we tested whether partners' WMC was associated with greater recall of postdiscussion problem-relevant information by regressing partners' recall scores onto partners' WMC scores and gender in a two-level model in which the nonindependence of couples' data was controlled in the second level of the model with a randomly varying intercept. Partners' WMC was, indeed, associated with greater recall of the problem-relevant information exchanged during the problem-solving discussions, $t(95) = 2.67, p = .009, r = .26$. Second, we tested whether partners' recall was associated with greater declines in problem severity, controlling for partner's WMC and gender. To do so, we conducted the same growth curve analysis described earlier, except the current model additionally regressed partners' recall scores and partners' WMC scores onto both the intercept and the time of assessment. Results indicated that partners' recall was associated with greater declines in problem severity, $t(241) = -2.68, p = .008, r = .17$. Finally, we calculated an estimate of the mediated effect, $B = -0.04$, and computed the 95% confidence intervals $[-0.09, -0.01]$ which indicated that the mediated effect was significant.

Alternative Explanations for the Benefits of WMC

To examine whether the benefits of WMC emerged due to factors associated with WMC (i.e., self-control, self-efficacy, distress tolerance, emotion regulation, motivation) and/or identifying better solutions, we conducted two supplemental sets of analyses (see the online supplemental materials for full results). The first revealed that none of these alternatives mediated the

association between WMC and changes in problem severity. The second demonstrated that controlling for these alternatives did not change the primary results.

Discussion

Intimates often discuss the potential causes of, and solutions to, their relationship problems with their partners to motivate behavioral changes and thus resolve those problems (Overall & McNulty, 2017). Partners' ability to recall this information should determine whether it shapes future problem-solving behavior and thus facilitates successful problem resolution. The current study provides initial evidence that partners' WMC, which facilitates ongoing conversation processing and encoding of information into long-term memory (Unsworth, 2016), promotes effective problem resolution. In particular, partners' WMC significantly predicted their recall of problem-relevant information following a discussion of a relationship problem, and thus greater declines in the severity of that problem over the following 8 months. Further, WMC was not measurably associated with (a) problem severity prior to the discussion, suggesting that intimates did not select problems that were easier to resolve if their partners possessed greater WMC, or (b) making greater progress at resolving the problem during the original discussion, suggesting that the benefits of WMC emerged over time, when intimates needed to recall information that their partners had communicated. Further, other factors associated with WMC (e.g., self-control, self-efficacy) did not account for these effects. To our knowledge, this study is the first to demonstrate not only that WMC predicts recall of authentic conversations, but also that such a basic cognitive ability can affect, through veridical recall, relationship outcomes.

The strengths of this study are that it assessed a diverse community sample that enhances our confidence in the generalizability of the results, used objective measures of WMC and recall of problem-relevant information that prevent response biases typical of self-reports, and used a longitudinal design to track changes in the problem severity. Despite these strengths, however, several limitations should be addressed in future research, including replication attempts. First, although we hypothesized that prolonged memory of problem-relevant communication would facilitate problem resolution, we assessed recall immediately, not over the course of the year. Nevertheless, given that immediate recall is highly predictive of delayed recall (e.g., Jonsson et al., 2014), we remain confident in this mechanism. Second, we did not examine the type of communication that partners remembered. Given that certain types of communication (e.g., constructive suggestions, encouragement) facilitate problem resolution better than others (e.g., sarcasm, exaggeration; see Overall & McNulty, 2017), recalling certain messages may be less beneficial and even harmful. Future research would benefit by examining whether the type of communication exchanged moderates these effects. Finally, although we demonstrated that WMC's benefits were not due to several confounding factors (e.g., self-control), we were unable to address whether other factors associated with WMC and/or problem-solving success (e.g., general intelligence, verbal fluency, attentional capacity, long-term memory retrieval ability; Conway, Kane, & Engle, 2003) might account for these results.

Context

The current research contributes to a research program by Baker and Russell investigating relationship problem solving. This research question was raised by Baker, who recognized that

basic cognitive processes are an understudied and likely important predictor of problem solving. Because of his expertise with WMC, Kane was invited to contribute to that part of the study design and the article.

References

- Baker, L. R., & Baumeister, R. F. (2017). Alone and impulsive: Self-regulatory capacity mediates and moderates the implications of exclusion. In K. W. Williams & S. A. Nida (Eds.), *Frontiers handbook of ostracism, social exclusion, & rejection* (pp. 29–45). New York, NY: Psychology Press.
- Baker, L. R., & McNulty, J. K. (2011). Self-compassion and relationship maintenance: The moderating roles of conscientiousness and gender. *Journal of Personality and Social Psychology, 100*, 853–873. 10.1037/a0021884
- Baker, L. R., & McNulty, J. K. (2015). Adding insult to injury: Partner depression moderates the association between partner-regulation attempts and partners' motivation to resolve interpersonal problems. *Personality and Social Psychology Bulletin, 41*, 839–852. 10.1177/0146167215580777
- Benjamin, A. S., Bjork, R. A., & Schwartz, B. L. (1998). The mismeasure of memory: When retrieval fluency is misleading as a metamnemonic index. *Journal of Experimental Psychology: General, 127*, 55–68. 10.1037/0096-3445.127.1.55
- Bryk, A. S., & Raudenbush, S. W. (1987). Application of hierarchical linear models to assessing change. *Psychological Bulletin, 101*, 147–158. 10.1037/0033-2909.101.1.147
- Conway, A. R. A., Kane, M. J., Bunting, M. F., Hambrick, D. Z., Wilhelm, O., & Engle, R. W. (2005). Working memory span tasks: A methodological review and user's guide. *Psychonomic Bulletin & Review, 12*, 769–786. 10.3758/BF03196772
- Conway, A. R. A., Kane, M. J., & Engle, R. W. (2003). Working memory capacity and its relation to general intelligence. *Trends in Cognitive Sciences, 7*, 547–552. 10.1016/j.tics.2003.10.005
- Fine, E. M., Delis, D. C., Wetter, S. R., Jacobson, M. W., Hamilton, J. M., Peavy, G., . . . Salmon, D. P. (2008). Identifying the “source” of recognition memory deficits in patients with Huntington's disease or Alzheimer's disease: Evidence from the CVLT-II. *Journal of Clinical and Experimental Neuropsychology, 30*, 463–470. 10.1080/13803390701531912
- Foster, J. L., Shipstead, Z., Harrison, T. L., Hicks, K. L., Redick, T. S., & Engle, R. W. (2015). Shortened complex span tasks can reliably measure working memory capacity. *Memory & Cognition, 43*, 226–236. 10.3758/s13421-014-0461-7
- Gates, A. I. (1918). Correlations of immediate and delayed recall. *Journal of Educational Psychology, 9*, 489–496. 10.1037/h0074445
- Jonsson, B., Wiklund-Hörnqvist, C., Nyroos, M., & Börjesson, A. (2014). Self-reported memory strategies and their relationship to immediate and delayed text recall and working memory capacity. *Education Inquiry, 5*, 385–404. 10.3402/edui.v5.22850

- Kiewra, K. A., & Benton, S. L. (1988). The relationship between information processing ability and notetaking. *Contemporary Educational Psychology, 13*, 33–44. 10.1016/0361-476X(88)90004-5
- MacKinnon, D. P., Fritz, M. S., Williams, J., & Lockwood, C. M. (2007). Distribution of the product confidence limits for the indirect effect: Program PRODCLIN. *Behavior Research Methods, 39*, 384–389. 10.3758/BF03193007
- MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behavioral Research, 39*, 99–128. 10.1207/s15327906mbr3901_4
- McGonagle, K. A., Kessler, R. C., & Schilling, E. A. (1992). The frequency and determinants of marital disagreements in a community sample. *Journal of Social and Personal Relationships, 9*, 507–524. 10.1177/0265407592094003
- McNulty, J. K., & Russell, V. M. (2010). When “negative” behaviors are positive: A contextual analysis of the long-term effects of problem-solving behaviors on changes in relationship satisfaction. *Journal of Personality and Social Psychology, 98*, 587–604. 10.1037/a0017479
- Overall, N. C., & McNulty, J. K. (2017). What type of communication during conflict is beneficial for intimate relationships? *Current Opinion in Psychology, 13*, 1–5. 10.1016/j.copsyc.2016.03.002
- Redick, T. S., Broadway, J. M., Meier, M. E., Kuriakose, P. S., Unsworth, N., Kane, M. J., & Engle, R. W. (2012). Measuring working memory with automated complex span tasks. *European Journal of Psychological Assessment, 28*, 164–171. 10.1027/1015-5759/a000123
- Storaasli, R. D., & Markman, H. J. (1990). Relationship problems in the early stages of marriage: A longitudinal investigation. *Journal of Family Psychology, 4*, 80–98. 10.1037/0893-3200.4.1.80
- Unsworth, N. (2016). Working memory capacity and recall from long-term memory: Examining the influences of encoding strategies, study time allocation, search efficiency, and monitoring abilities. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 42*, 50–61. 10.1037/xlm0000148