When do primes go bad?

A corpus of orthographically related primes that inhibit fragment completion

OLGA RASS AND P. ANDREW LEYNES

College of New Jersey, Ewing, New Jersey

The memory block effect (MBE) occurs when orthographically similar words inhibit retrieval. Previous studies have published 55 different stimuli that produce the MBE in word fragment completion. This small number of stimuli constrains experimental designs, presents serious obstacles for using neuroimaging to elucidate neural substrates of blocking, and raises concern that the MBE is limited to a particular group of words. A pool of 315 stimulus words was tested in a traditional MBE paradigm, and the results demonstrated that the MBE generalizes to other stimuli. This study also expands the number of stimuli that produce the MBE because 185 new stimuli produced blocking effects. As a result, the current list of 240 MBE stimuli can be used for word fragment research including cognitive neuroscience investigations of retrieval inhibition. A table of MBE stimuli is available in an archived appendix that can be downloaded from www.psychonomic.org/archive.

Retrieval failures are part of our everyday cognition. For example, recalling the capital of Australia can often create momentary confusion when one quickly realizes the famous city of Sydney is not the capital. Cues can aid retrieval in many cases, such as when *CANOPY* primes the retrieval of Australia's capital because it has the same first three letters and the same number of syllables as the correct answer. However, recent memory research has demonstrated that partial cuing with orthographically similar words *inhibits* retrieval of target words (Logan & Balota, 2003; Lustig & Hasher, 2001). For example, the cue *CRANBERRY* might slow or block successful retrieval because it is orthographically similar to the name of Australia's capital (Canberra).

The memory block effect (MBE) refers to cases in which an orthographically similar word impedes the retrieval of a known word. This effect has been studied in the laboratory using a word fragment completion task (Landau & Leynes, 2006; Smith & Tindell, 1997). During the first part of this task, participants are exposed to words that complete test fragments (positive primes) and other words that are orthographically similar to the solutions but cannot complete the fragment (blocking primes). Memory is then tested using an incidental memory test that involves completing word fragments. Control conditions consist of studying unrelated words (Kinoshita & Towgood, 2001; Smith & Tindell, 1997), studying unrelated primes or no prime exposure (Logan & Balota, 2003; Lustig & Hasher, 2001), or only no prime exposure (Landau & Leynes, 2006) in order to measure base rates of fragment completion. Typical results reveal that studying the blocking

prime (e.g., *BALLOON*) decreases the probability that the corresponding word fragment (*BAL_ON_*) will be completed (Kinoshita & Towgood, 2001; Landau & Leynes, 2006; Logan & Balota, 2003; Lustig & Hasher, 2001; Smith & Tindell, 1997), whereas seeing the positive prime (*BALCONY*) will increase the probability of completing the fragment relative to control conditions (Kinoshita & Towgood, 2001; Smith & Tindell, 1997). Such results support the idea that exposure to blocking primes disrupts the ability to retrieve words that complete the fragments and represents a case of retrieval inhibition.

Unfortunately, a clear theoretical explanation of the MBE mechanism has not emerged. Exploring its limits has determined that the effect is robust. The magnitude of the MBE is unaffected by conscious versus subthreshold presentation of study primes, different encoding tasks, increased time allotted to solve the fragment, and instructions to ignore blocking words (Landau & Leynes, 2006; Logan & Balota, 2003; Smith & Tindell, 1997). However, Smith and Tindell reported significant blocking when the study and test modality was visual, but did not observe blocking when primes were heard at study and the fragments were presented visually. Based on results across several studies, Smith and Tindell suggested that involuntary retrieval of negative primes resulted in unconscious blocks of memory, thereby suggesting that the MBE results from the influence of implicit memory. Alternatively, Kinoshita and Towgood (2001) claimed that the MBE results from spontaneous recognition (i.e., explicit memory) of the blocking primes when they observed a decreased MBE with divided attention at encoding. Their claim has been challenged recently by evidence that

P.A. Leynes, leynes@tcnj.edu

the MBE magnitude is unaffected by manipulations that enhance recognition (Landau & Leynes, 2006; see also Lustig & Hasher, 2001). As a result, the mechanism that produces the MBE phenomenon remains an unresolved issue.

Studying the MBE using word fragment completion has several advantages. First, it is similar to other retrieval inhibition phenomena, including directed forgetting, retrieval-induced forgetting, negative priming, feeling-of-knowing (FOK), and tip-of-the-tongue (TOT) effects (Landau & Leynes, 2006; Logan & Balota, 2003; Smith & Tindell, 1997). Therefore, defining the MBE mechanism can potentially provide a better understanding of retrieval inhibition models and everyday memory failures, such as lexical retrieval difficulties that are common occurrences in older adults (Logan & Balota, 2003). Second, the simple design yields objective measures of memory (e.g., proportion of errors, completions, etc.), rather than relying on subjective assessments of memory (e.g., FOK, TOT) that often have complicated instructions. Finally, understanding the MBE may result in applications that help patients with neurological disorders that include memory dysfunctions, such as repression, obsessive-compulsive disorder, and Alzheimer's disease (Logan & Balota, 2003; Smith & Tindell, 1997).

The lack of a substantial pool of MBE stimuli continues to be a limitation for using a word fragment paradigm. Table 1 displays the total number of unique stimuli (55) yielded by past studies (Kinoshita & Towgood, 2001; Logan & Balota, 2003; Smith & Tindell, 1997).¹ In fact, the conclusions from these studies were based on only a few trials in each experimental condition (range, 4–16 items/condition). A larger pool of stimuli is desirable for a number of reasons. First, testing a larger number of stimuli has the potential to demonstrate that the MBE is not limited to a special class of stimuli. Second, a larger stimulus pool would increase power and enable matching various conditions based on a number of variables, such as priming/blocking magnitude, base rate of fragment completion, word frequency, etc. Third, a larger pool would allow measurement of neural activity using neuroimaging technology, such as functional magnetic resonance imaging (fMRI) and event-related potentials (ERPs), because this technology requires multiple stimulus presentations in order to average out background (random) brain activity. For example, ERP studies require a minimum of 10 to 15 trials per condition in most applications in order to obtain acceptable signal-to-noise ratios for ERP averages (Pincton et al., 2000), and stimuli cannot be repeated in ERP memory studies because mere repetition influences ERP activity (see Rugg, 1995, for a review). For these reasons, the goal of the current study was to develop, test, and present a larger pool of MBE stimuli in an effort to (1) demonstrate the generality of the phenomenon, and (2) expand the list of stimuli that produce the MBE.

METHOD

Participants

One hundred eighty students at the College of New Jersey 18 years or older participated in the experiment for partial course credit or extra credit.

Materials

The stimuli, consisting of blocking primes, positive primes, and corresponding word fragments, are displayed in the first three columns of Table 2. Positive primes were selected from the Nelson, McEvoy, and Schreiber (1998) University of South Florida fragment norm database.² The rules described by Smith and Tindell (1997) were used to create the fragments. More specifically, two to four letters were deleted from positive primes, and blanks were inserted to form fragments. There were no more than two blanks in a row for any fragment. Therefore, the positive primes (e.g., *BALCONY*) always completed the word fragments (e.g., *BAL_ON_*).

Blocking primes are words that are orthographically similar to positive primes. These words were created by taking words from the Kučera and Francis (1967) corpus and matching them to positive primes. Blocking primes were selected based on the following criteria: (1) They did not complete the word fragments, (2) they were the same length as the fragment, (3) they had the same first letter as the positive prime, and (4) they shared at least three letters, with the shared letters in the same order for the prime words (Smith & Tindell, 1997). For example, the blocking prime *BALLOON* does not complete its corresponding fragment *BAL_ON_*, is of the same length as the fragment, shares the first letter (*B*), and shares four additional letters in the same order as the fragment (*A, L, O, N*).

The 315 stimuli were randomly separated into nine lists of 105 stimuli sets containing a positive prime, blocking prime, and corresponding target fragment. Each list was broken up into thirds (35 words) to counterbalance the stimuli so that each set appeared as a positive prime, a blocking prime, and a control prime in equal numbers across participants in our sample.

Procedure

One of nine lists was randomly assigned to each participant. The experimental session consisted of a study phase, where participants studied 70 primes (35 blocking primes and 35 positive primes), and a test phase, where participants completed 105 word fragments.

The procedure for the study phase followed Smith and Tindell (1997). Stimuli were presented serially in the center of the computer screen in white uppercase letters on a black background. Participants were instructed to complete an affect rating task of a randomly intermixed list of 35 positive primes and 35 blocking primes. For the task, they had 5 sec to indicate by keypress how the each word made them feel, with responses ranging from 1 (very bad) to 5 (very good). After five seconds elapsed without a judgment, the message "YOUR TIME IS UP" was displayed, and then the computer advanced to the next trial.

The procedure for the test phase followed Landau and Leynes (2006). One hundred and five fragments were presented serially in the center of the computer screen in white uppercase letters on a black background with an extra space in between each character to improve perception. Each character was the same size. An equal number of the test fragments (35) corresponded to the positive prime (that completed the fragment), blocking prime (orthographically similar to the fragment solution), and control conditions (solutions were unstudied). The instructions asked participants to type in missing letters in order to complete word fragments. The typed letters immediately replaced the blanks in the fragment. For the *BAL_ON_* fragment example, typing "C" and then "Y" would display the completed word *BALCONY*. Participants were instructed to avoid using slang words because they would be considered incorrect solutions. Typographical errors could be reduced by pressing the BACKSPACE key that cleared any entered letters and effectively redisplayed the original fragment. Participants were encouraged to be careful when entering letters because the computer automatically advanced to the next word when the last fragment blank was filled by keyboard input. After 10 sec had elapsed without a complete solution, the message "YOUR TIME IS UP" was displayed, and the computer automatically advanced to the next fragment. Not allowing participants to retype the entire solution provided a very conservative estimate of the MBE magnitude because participants

Table 1
Memory Block Effect Published Stimuli

Smith and Tindell (1997)				Kinoshita and Towgood (2001)				Logan and Balota (2003)			
Block Prime	Prime	Fragment		Block Prime	Prime	Fragment		Block Prime	Prime	Fragment	
1. ANALOGY	ALLERGY	A_L__GY	13.	ABSOLUTE	ABSENTEE	A_B_S__T__E	32.	BOOKCASE	BLOCKADE	B_O__K_A__E	
2. BRIGADE	BAGGAGE	B_G_A__E	14.	ANAEMIA	ANATOMY	A_N_A__M__	33.	BROCCOLI	BRACELET	B_R__C_L__	
3. COTTAGE	CATALOG	C_T_A__G	15.	ACHIEVE	ARCHIVE	A_C_H__V__	34.	CONSTANT	CANISTER	C_N__S_T__	
4. CHARTER	CHARITY	C_H_A_R__T__	16.	BALONEY	BALCONY	B_A_L__O__Y__	35.	CAMPAIGN	CHAMPION	C__A_M_P_I__N__	
5. CLUSTER	COUNTRY	C_U__T_R__	17.	BERMUDA	BARMAID	B__R_M__D__	36.	CONTEMPT	CONQUEST	C_O_N__E__T__	
6. CRUMPET	CULPRIT	C_U__P__T__	18.	BRUSQUE	BAROQUE	B_R__Q_U__E__	37.	DIALOGUE	DISGUISE	D_I_G_U__E__	
7. DENSITY	DIGNITY	D__N_I_T_Y__	19.	COLLECT	COLLATE	C_O_L_L__T__	38.	DIPLOMAT	DISPOSAL	D_I_P_O__A__	
8. FIXTURE	FAILURE	F_I__U_R_E__	20.	CONSPIRE	CONSERVE	C_O_N_S__R__E__	39.	DEVIANCE	DIVISION	D_V_I__N__	
9. HOLSTER	HISTORY	H__S_T__R__	21.	CONTAIN	CONTENT	C_O_N_T__N__	40.	ELUSIVE	ELASTIC	E_L__S__I__	
10. TONIGHT	TANGENT	T_N_G__T__	22.	DIOCESE	DECEASE	D__C_E__S_E__	41.	ELEPHANT	ELEGANCE	E_L_E__A_N__	
11. TRILOGY	TRAGEDY	T_R_G__Y__	23.	DEFUNCT	DEFAULT	D_E_F__U__T__	42.	EVIDENCE	EPIDEMIC	E_I_D_E__C__	
12. VOYAGER	VOLTAGE	V_O__A_G_E__	24.	HAIRPIN	HARPOON	H_A_R_P__N__	43.	EXERCISE	EXTERIOR	E_X_E_R_I__	
			25.	HEATHEN	HEALTHY	H_E_A__T_H__	44.	GREETING	GARRISON	G_R__I__N__	
			26.	LIBRARY	LIBERTY	L_I_B__R__Y__	45.	GUIDANCE	GUARDIAN	G_U__D__A_N__	
			27.	MULTIPLY	MONOPOLY	M__P__L_Y__	46.	HERITAGE	HOSPITAL	H__I_T_A__	
			28.	PERFUME	PERFORM	P_E_R_F__M__	47.	MAGICIAN	MAGAZINE	M_A_G__I_N__	
			29.	PRESSURE	PRESERVE	P_R_E_S__R__E__	48.	MIDNIGHT	MIDPOINT	M_I_D__I__T__	
			30.	REPROVE	REVOLVE	R_E__O__V_E__	49.	MISTRESS	MOISTURE	M_I_S_T__R_E__	
			31.	THOUGHT	THROUGH	T_H__O_U_G__	50.	ORNAMENT	ORDINARY	O_R__N_A__	
							51.	OPPOSITION	OPPOSITE	O_P_P_O__T__	
							52.	PATIENCE	PARTICLE	P_A_T_I_C__E__	
							53.	PROPERTY	PROPHETCY	P_R_O_P__E__Y__	
							54.	SCULPTOR	SCHEDULE	S_C__U_L__	
							55.	SYMPHONY	SYMPATHY	S_Y_M_P__H_Y__	

could clearly see that a blocking prime cannot complete the fragment (Landau & Leynes, 2006), whereas tests where solutions are retyped or copied might not lead to realization that the offered solution does not fit the fragment.

Fragment solutions were coded in the following manner: (1) *correct* response when the solution matched the positive prime or in some circumstances was a valid English word (e.g., from Kinoshita & Towgood, 2001; the fragment *R E _ O _ V E* can be completed with *RESOLVE* or *REVOLVE*); (2) *omission* error when no letters were entered during the trial, (3) *intrusion* error when a nonword answer could be pronounced as a blocking word or included the same letters as the blocking word, and (4) *other* error when at least one blank was filled or a nonword was entered. Some examples of intrusion errors include (1) the solution *BALQONN*, because it is highly similar to the blocking prime (*BALLOON*) and very distinctive from any valid solution (*BALCONY*), and (2) the solution *ANBORMAL* because it is similar to the blocking prime (*ABNORMAL*) and not a valid solution (*ARBOREAL*).

RESULTS

The results are presented in two distinct sections in order to address the two purposes of this investigation. The first goal was to determine whether the MBE generalizes beyond select stimuli used in previous research (Kinoshita & Towgood, 2001; Landau & Leynes, 2006; Logan & Balota, 2003; Lustig & Hasher, 2001; Smith & Tindell, 1997). To examine this question, the first set of results reports the effect of type of prime (blocking, control, positive) on average performance measures. These average performance measures were derived from averaging across individual stimuli for each participant and then averaging across participants to form the group means. Figure 1 displays this group averaged data in three panels: (A) the proportion of correctly completed fragments, (B) proportion of errors, and (C) response times (RTs).

The second goal of this study was to expand the pool of MBE stimuli. Accordingly, a second set of analyses examines mean fragment completion rates averaged across participants for each stimulus in an effort to evaluate the

MBE for each item in the corpus. These data are presented in the Appendix, which displays the proportion of accurate fragment completion in each of the three experimental conditions (blocking primes, control, and positive prime) for each of the individual MBE stimuli.

The MBE in Average Performance Measures

Correctly completed fragments. To test for the MBE, fragment completions were analyzed using a repeated measures ANOVA with one factor of prime (blocking, control, positive). The significant main effect of prime indicated that fragment completion varied across primes [$F(2,358) = 661.35, p < .001, \eta^2 = .79$]. Post hoc comparisons (Bonferroni-adjusted F tests) revealed that exposure to blocking primes decreased the completion rate relative to the control condition [$F(1,179) = 66.35, p < .001, \eta^2 = .27$], whereas exposure to positive primes increased fragment completion relative to the control condition [$F(1,179) = 713.32, p < .001, \eta^2 = .80$]. Therefore, the basic memory block effects were replicated in this study.

Errors in fragment completion. Errors were analyzed using a 3 (prime: blocking, control, positive) $\times$ 3 (error: omission, other, intrusion) repeated measures ANOVA. The significant main effect of prime [$F(2,358) = 138.30, p < .001, \eta^2 = .45$] indicated that errors varied as a function of prime, thereby mirroring analysis of completed fragments.³ Inspection of Figure 1 suggests that the significant error main effect [$F(2,358) = 661.35, p < .001, \eta^2 = .79$] resulted from fewer intrusions than the other types of errors. This result is not surprising given that the test format created a situation in which intrusion errors were obvious. Most importantly, a significant prime $\times$ error interaction [$F(4,716) = 21.08, p < .001, \eta^2 = .10$] revealed that the pattern of errors varied for the primes. To explore the prime $\times$ error interaction, the effect of prime on each error was examined separately using Bonferroni-corrected F tests. These comparisons revealed that omissions [$F(2,358) = 90.32, p < .001, \eta^2 = .33$], other errors

Figure 1. The proportions of accurately completed fragments (panel A), errors in fragment completion (panel B), and response times (panel C) as a function of the type of prime. Error bars are standard error of the mean. Asterisks in the figure indicate when a condition varied significantly from the control condition.

[$F(2,358) = 119.33, p < .001, \eta^2 = .40$], and intrusions [$F(2,358) = 63.88, p < .001, \eta^2 = .26$] all varied as a function of prime. In order to understand errors across prime conditions completely, additional Bonferroni-corrected F tests compared errors in the positive and blocking conditions to the control condition. The results of these contrasts revealed that positive primes reduced all three types of errors [omissions, $F(1,179) = 130.54, p < .05, \eta^2 = .42$; other, $F(1,179) = 123.07, p < .05, \eta^2 = .41$; intrusions, $F(1,179) = 11.81, p < .05, \eta^2 = .06$]. Conversely, blocking primes increased intrusions [$F(1,179) = 56.42, p < .05, \eta^2 = .24$] and other errors [$F(1,179) = 11.24, p < .05, \eta^2 = .06$], but the number of omissions did not differ between the blocking and control conditions [$F(1,179) = 2.26, p = .13$].

Collectively, these results are strong evidence that exposure to the blocking prime created a specific type of interference on fragment completion. Exposure to blocking primes did not lead people to simply withhold responses at a higher rate than in the control condition. Instead, people attempted to insert the blocking prime into the fragment, entered a few letters, or entered a nonword.

RTs for accurate solutions. RTs to make the initial keypress and the total time to enter an accurate solution were measured on each trial. The entry RT (time to enter a solution) was calculated by subtracting the initial keypress RT from the total RT. Trials on which no response was entered (i.e., omissions) were excluded from the RT analyses.

The analysis of initial keypress RT revealed a significant effect of prime [$F(2,358) = 142.92, p < .001, \eta^2 = .44$]. Post hoc comparisons indicated that positive primes resulted in faster RTs than the control condition [$F(1,179) = 245.92, p < .001, \eta^2 = .58$] and a marginally significant difference between the control and blocking conditions [$F(1,179) = 3.58, p = .06, \eta^2 = .02$], which replicates the pattern observed by Logan and Balota (2003) using a different paradigm. There was no difference in entry RTs across the positive, control, and blocking conditions [$F(2,358) = 1.2, p = .30$]. Collectively, these results indicate that exposure to the blocking prime delayed the start to enter a solution, but the primes did not alter the time to enter a solution once participants began to solve the fragment.

The MBE in Individual Stimuli

The Appendix presents MBE stimuli, including positive primes, blocking primes, and target fragments, as well as the proportion of accurate fragment completion in each of the three conditions. The priming columns show the proportion of completion for positive and blocking conditions relative to the control condition that measured the base rate of completion. These values were calculated by subtracting the proportion of completions in the positive prime or the blocking prime conditions from the control condition. Inspection of these columns shows that some stimuli are more effective as blocking stimuli, others are more effective as positive primes, and a number are effective as both. In this study, blocking was defined as a negative value in the blocking column in the Appendix, which indicates that

fewer of the fragments were completed when the blocking prime was studied relative to the control condition. The Appendix displays the stimuli tested sorted by the size of the block effect. One hundred eighty-five (59%) of the stimuli tested produced blocking, and 130 stimuli did not produce blocking. A closer inspection of these stimuli revealed that 32 items did not produce blocking because the base completion rate in the control condition was 0, and another 21 stimuli had a very low base completion rate (.05) making it difficult to observe blocking. These low rates indicate that for unknown reasons these fragments were difficult to complete for our participants. Excluding these stimuli reveals that 71% of the stimuli elicited blocking, whereas the remaining 30% did not. This careful analysis quite clearly demonstrates that the MBE in a word fragment completion paradigm is very robust.

DISCUSSION

The purpose of the present investigation was twofold: (1) to determine the generality of the memory block effect, and (2) to expand the MBE stimuli. Using the rules originally described by Smith and Tindell (1997), a list of 315 sets of blocking primes, positive primes, and word fragments were created and tested.

Overall, several dependent measures indicated that the MBE does not depend on a specific set of stimuli. First, examination of completion rates revealed that exposure to the blocking primes decreased fragment completion rates relative to the control condition. Although the size of MBE in this study appears to be smaller than in other studies, it is important to emphasize that the test format and the unrefined stimulus pool provided a very conservative estimate of blocking.⁴ Second, examination of the errors revealed that omissions were equally likely in the blocking and control conditions, but intrusion errors were more likely when the blocking prime was studied. This is a profound result given that it was obvious to the participants that the blocking prime would not complete the fragment in the current study. Third, the analyses of the RTs recorded on trials when the correct solution was entered revealed that exposure to the blocking prime slowed the time to enter the first letter, but it did not affect total time to enter the solution. Collectively, these results are convincing evidence that exposure to orthographically similar primes slows retrieval when the fragment is solved and inhibits successful retrieval in many other cases because people tend to fixate on the blocking prime.

With regard to the second goal of the present study, blocking was observed for 185 new fragment sets. As a result, the entire list of MBE stimuli is sufficient for most basic memory studies as well as neuroimaging studies that use word fragment completions to measure blocking. This database is flexible because stimuli could be selected based on any number of criteria. For example, stimuli could be selected because the probability of blocking is greater than priming (or vice versa), the probabilities of priming and blocking are relatively equal, the base completion rates are equal, or to control for word frequency.

AUTHOR NOTE

Correspondence concerning this article should be addressed to P. A. Leynes, Department of Psychology, College of New Jersey, P.O. Box 7718, Ewing, NJ 08628-0718 (e-mail: leyne@tcnj.edu).

REFERENCES

- KINOSHITA, S., & TOWGOOD, K. (2001). Effects of dividing attention on the memory-block effect. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, **27**, 889-895.
- KUČERA, H., & FRANCIS, W. N. (1967). *Computational analysis of present-day American English*. Providence, RI: Brown University Press.
- LANDAU, J. D., & LEYNES, P. A. (2006). Do explicit memory manipulations affect the memory blocking effect? *American Journal of Psychology*, **119**, 463-479.
- LOGAN, J. M., & BALOTA, D. A. (2003). Conscious and unconscious lexical retrieval blocking in younger and older adults. *Psychology & Aging*, **18**, 537-550.
- LUSTIG, C., & HASHER, C. (2001). Implicit memory is vulnerable to proactive interference. *Psychological Science*, **12**, 408-412.
- NELSON, D. L., McEVOY, C. L., & SCHREIBER, T. A. (1998). *The University of South Florida word association, rhyme, and fragment norms*. Retrieved September 22, 2006, from w3.usf.edu/FreeAssociation
- PINCTION, T. W., BENTIN, S., BERG, P., DONCHIN, E., HILLYARD, S. A., JOHNSON, R., JR., ET AL. (2000). Guidelines for using human event-related potentials to study cognition: Recording standards and publication criteria. *Psychophysiology*, **37**, 127-152.
- RUGG, M. D. (1995). ERP studies of memory. In M. D. Rugg & M. G. H. Coles (Eds.), *Electrophysiology of mind: Event-related brain potentials and cognition*. New York: Oxford University Press.
- SMITH, S. M., & TINDELL, D. R. (1997). Memory blocks in word fragment completion caused by involuntary retrieval of orthographically related primes. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, **23**, 355-370.

NOTES

1. Kinoshita and Towgood (2001) used 30 stimuli sets—19 of which were new and 10 that had been used by Smith and Tindell (1997). Logan

and Balota (2003) used 36 stimuli sets—24 of which were new and 12 that had been used by Smith and Tindell. Lustig and Hasher (2001) increased the stimulus pool by using the Smith and Tindell stimuli in typical form and then reversing the positive primes and blocking primes to create an alternate list. For example, they used the blocking word "ANALOGY," the positive prime "ALLERGY," and the fragment "A _ L _ _ G Y" for one group of participants and the blocking word "ALLERGY," the positive prime "ANALOGY," and the fragment "A _ _ L _ G Y" for another group. Landau and Leynes (2006) used the same 30 stimuli that had been used by Kinoshita and Towgood.

2. Conceptual primes that prime (at $\geq .3$) the positive primes in the list can be obtained by searching the Nelson, McEvoy, and Schreiber (1998) database.

3. Because the mean errors (overall) can be simply calculated as $1 - p(\text{completion})$, we omit these means in order to conserve space.

4. Kinoshita and Towgood (2001) provide completion rates for the individual stimuli that they used, which can be used to estimate blocking effects for their stimuli. Inspection of their data also suggests that stimuli vary in their ability to elicit blocking; however, the percentage of noneffective stimuli in their article (27%) appeared to be less than that observed in this study (41%).

ARCHIVED MATERIALS

The following materials associated with this article may be accessed through the Psychonomic Society's Norms, Stimuli, and Data archive, www.psychonomic.org/archive.

To access these files, search the archive for this article using the journal name (*Behavior Research Methods*), the first author's name (Rass), and the publication year (2007).

FILE: Rass-BRM-2007.zip

DESCRIPTION: The compressed archive file contains two files: Rass(2007).txt, containing memory block effect published stimuli; Rass(2007).xls, containing the above information in Excel spreadsheet format.

AUTHOR'S E-MAIL ADDRESS: leyne@tcnj.edu

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