

Always on My Mind: Exploring How Frequent, Recent, and Vivid Television Portrayals Are Used in the Formation of Social Reality Judgments

KARYN RIDDLE

*School of Journalism & Mass Communication, University of Wisconsin, Madison,
Madison, Wisconsin, USA*

Prior research has found consistent support for the heuristic processing model of cultivation effects, which argues that cultivation effects can be explained by the availability heuristic. The present study represents an experimental test of the heuristic processing model and tests the impact of frequency, recency, and vividness on construct accessibility and social reality beliefs. 213 students participated in a $2 \times 2 \times 2$ prolonged exposure experimental design varying the frequency of exposure to violent television programs, the level of vividness in the programs, and recency of exposure. Dependent measures were accessibility and social reality beliefs. Results showed that reaction times were largely unresponsive to the independent variables. Although there were no main effects for frequency on social reality beliefs, there was a significant interaction between frequency and vividness on beliefs: People watching vivid violent media gave higher estimates of the prevalence of crime and police immorality in the real world in the $3\times$ viewing condition than those in the $1\times$ viewing condition. In concluding, it is argued that this study has important implications for the heuristic processing model, cultivation theory, and research into vividness effects.

There is considerable interest in understanding the consequences of long-term exposure to the mass media. Cultivation theory (Gerbner, 1969) pro-

Address correspondence to Karyn Riddle, School of Journalism & Mass Communication, University of Wisconsin, Madison, 5014 Vilas Hall, 821 University Ave., Madison, WI 53711. E-mail: karynriddle3@yahoo.com

vides a useful framework for understanding long-term media effects with a body of research that suggests the mass media have a small but significant impact on people's views of social reality. The heuristic processing model of cultivation effects (Shrum, 1996) has been employed in recent years to explain television's impact on social reality beliefs. The heuristic processing model argues that frequent television exposure impacts people's views of social reality through the availability heuristic (Tversky & Kahneman, 1973). Although numerous studies support the heuristic processing model, it has yet to be tested using an experimental method. The goal of this research project, therefore, is to test the propositions of the heuristic processing model using a prolonged exposure experiment to determine the differential effects of frequency, recency, and vividness on people's social reality beliefs.

THE HEURISTIC PROCESSING MODEL OF CULTIVATION EFFECTS

Cultivation is one of the most prominent (Potter & Riddle, 2007), albeit criticized (e.g., Doob & Macdonald, 1979; Hirsch, 1980), mass communication theories. Cultivation theory proposes that the more time people spend "living" in the television world, the more likely they are to believe social reality is congruent with television's reality. Although the theory can be applied to any recurring themes on television, it is most frequently used to explain the effects of television violence (for a review, see Shanahan & Morgan, 1999). Cultivation theory argues that heavy exposure to television violence leads to the belief that crime and violence are prevalent in the real world.

Shrum's (1996) heuristic processing model employs the availability heuristic (Tversky & Kahneman, 1973) to explain cultivation effects. The availability heuristic is a shortcut people use when they use information that is easily accessible in memory to judge the frequency of events. Shrum has connected these research findings to cultivation research and argues that heavy television viewers, due to frequent and recent exposure to vivid images on television, will have television constructs easily accessible in memory and will use said constructs when asked to make frequency estimates for events related to television messages.

Indeed, numerous studies have provided empirical support for the proposition that construct accessibility mediates the cultivation effect (Shrum, 1996, 2001; Shrum & O'Guinn, 1993; Shrum, Wyer, & O'Guinn, 1998). Although this line of research represents one of the most successful attempts at specifying the psychological mechanisms that govern the cultivation process, some questions remain unanswered. The majority of the heuristic processing studies are correlational and, as a result, alternative explanations for the

findings remain. Experimental research could provide a nice complement to the existing cross-sectional survey research by providing causal support for the claims of the heuristic processing model.

Furthermore, an experimental design could help provide a clearer explanation for television's impact on accessibility. Shrum (1999, 2001) cites prior research into vividness (Reyes, Thompson, & Bower, 1980) as well as frequency and recency (Wyer & Shrum, 1989) and argues heavy viewers' frequent and recent exposure to vivid violent messages on television increases the accessibility of related thoughts. However, there is disagreement within cognitive psychology about the relative contributions of frequency and recency in terms of which is the more powerful force on construct accessibility (e.g., Higgins, Bargh, & Lombardi, 1985). In order for the heuristic processing model to be applicable to cultivation theory, a theory of long-term effects, it must be demonstrated that *frequency* has a unique and meaningful impact on construct accessibility. Furthermore, it has more recently been argued that cultivation research would benefit from a better understanding of the *relative* contributions of frequency, recency, and vividness on construct accessibility (Busselle & Shrum, 2003).

Therefore, this study will provide an experimental test of the heuristic processing model. More specifically, it will test the effects of frequency, recency, and vividness on accessibility and social reality beliefs. It is important to acknowledge that many scholars have argued that experiments are an inappropriate method for testing cultivation theory, a theory focusing on people's long-term *immersion* into the world of television (e.g., Potter, 1994; Shanahan & Morgan, 1999). It must be emphasized, therefore, that this study is not intended to be a test of cultivation theory; rather, it is a test of the heuristic processing model, which makes testable claims about the impact of frequency, recency, and vividness on construct accessibility and social reality beliefs.

HYPOTHESES AND RESEARCH QUESTIONS

Shrum (1999) argues that heavy television viewers' frequent exposure to media violence renders related constructs accessible in memory. Although research from cognitive psychology suggests that frequent exposure to stimuli leads to the chronic accessibility of related constructs in memory (e.g., Higgins & King, 1981), this has never been tested in a cultivation framework; that is, there is no causal evidence that repeat exposure to media violence increases the accessibility of thoughts about real-world crime and violence. Furthermore, it has yet to be shown that prolonged exposure to violence has a direct impact on people's estimates of the prevalence of real-world violence. Therefore, the following predictions were made:

- H1a: There will be a main effect for frequency on accessibility, such that more frequent exposure to media violence will result in greater accessibility of violent thoughts than less frequent exposure.
- H1b: There will be a main effect for frequency on social reality beliefs, such that more frequent exposure to media violence will result in higher estimates about the prevalence of violence in society than less frequent exposure.

Some researchers have suggested that it may be heavy viewers' recent, not frequent, exposure to television that is responsible for the high accessibility of television constructs (Berkowitz & Rogers, 1986; Shrum, 1999; Tamborini, Zillmann, & Bryant, 1984). Indeed, there is an abundance of research demonstrating the mass media's ability to prime constructs and make them accessible in viewers' minds in the short term (for a review, see Roskos-Ewoldsen, Roskos-Ewoldsen, & Carpentier, 2002). In such studies, the accessibility of violent constructs has been measured with word completion tasks (Carnagey & Anderson, 2005), thought listing tasks (Chory-Assad, 2004), and reaction times to aggressive and nonaggressive words (Anderson, Benjamin, & Barthallow, 1998). Although there are few experimental tests of cultivation theory, one such study did suggest that heavy viewers' fear responses to television might be the result of short-term priming (Tamborini et al., 1984). To test whether media violence can affect social reality beliefs pertaining to crime and violence as well as accessibility in the short-term, the following hypotheses were proposed:

- H2a: There will be a priming effect on accessibility, such that recent exposure to media violence will result in greater accessibility of violent thoughts than less recent exposure.
- H2b: There will be a priming effect on social reality beliefs, such that recent exposure to media violence will result in higher estimates about the prevalence of violence in society than less recent exposure.

Shrum (1999) also argues that the level of vividness in a mass media portrayal might be one factor that affects the accessibility of related constructs in memory. The term *vividness* has been defined as information presented in a format that is "(a) emotionally interesting, (b) concrete and imagery-provoking, and (c) proximate in a sensory, temporal, or spatial way" (Nisbett & Ross, 1980, p. 45). Although vivid stimuli have few persuasive effects (Taylor & Thompson, 1982), vivid content is more available cognitively than nonvivid content (Busselle & Shrum, 2003; Shedler & Manis, 1996). No existing tests, however, have directly tested the effects of vividness on accessibility and social reality beliefs. Therefore, the following were proposed:

- H3a: There will be a main effect for vividness on accessibility. Participants who view a vivid violent message will have violent thoughts more accessible than participants who view a nonvivid violent message.
- H3b: There will be a main effect for vividness on social reality beliefs. Participants who view a vivid violent message will give higher estimates of the prevalence of violence in society than participants who view a nonvivid violent message.

Research into desensitization gives reason to suspect that repeat exposure to violence that is particularly vivid and graphic might lead to a decrease in accessibility. After all, as people watch more violence, they become less likely to think of it as being violent (Linz, Donnerstein, & Penrod, 1984) and they experience less negative physical arousal (Mullin & Linz, 1995). Therefore, the desensitization literature has shown that repeat exposure to explicitly violent or sexual media leads to a lessening in emotional, attitudinal, and physiological reactions. What has not been demonstrated, however, is whether or not people experience a *cognitive* desensitization after repeat exposure to media violence. It has been shown that attention to a stimulus decreases when the stimulus no longer remains important, stimulating, or novel (Griffiths & Shuckford, 1989). If attention declines, it is possible that construct accessibility might also decline. Whether or not this is more likely to occur for vivid (vs. nonvivid) violence, however, is yet to be determined, as no known studies have tested the effects of vividness on the desensitization effect. Therefore, the following research questions were posed:

- RQ1a: How will vividness and frequency interact to impact construct accessibility?
- RQ1b: How will vividness and frequency interact to impact social reality beliefs?

A final goal of the present study is to determine the differential effects of recency and frequency. As stated above, there is disagreement within cognitive psychology about the relative contributions of frequency and recency in terms of which is the more powerful force on accessibility. A recent survey (Busselle & Shrum, 2003) addressed this issue and attempted to distinguish the differential effects of frequency and recency on exemplar accessibility. They found that participants who were heavy current television viewers recorded higher perceived ease of accessibility for content likely to be seen on television (drug busts, murders, etc) versus light current television viewers. Recent viewing, on the other hand, had no impact on participants' perceived ease of accessibility. This study's emphasis on perceived accessibility, as well as its survey methodology, however, are limitations that reduce our ability to make any conclusions regarding recency versus frequency.

Therefore, the following research questions were posed:

- RQ2a: When will the accessibility of violent thoughts be highest—when people are recently but not frequently exposed to violence on television or when people are frequently but not recently exposed to violence on television?
- RQ2b: When will the estimates of the prevalence of crime and violence be highest—when people are recently but not frequently exposed to violence on television or when people are frequently but not recently exposed to violence on television?

METHOD

The present study employs a prolonged exposure experimental design to test the heuristic processing model. Specifically, a $2 \times 2 \times 2$ between-subjects experimental design was conducted, varying the frequency of exposure (1 exposure vs. 3 exposures), vividness (vivid vs. nonvivid), and recency of exposure (immediate vs. delayed). The dependent variables were accessibility and social reality beliefs.

Procedure

All participants reported to a laboratory on campus for four separate appointments, with each appointment lasting one-half hour. All participants showed up for a half hour appointment on a Monday, a half hour appointment on a Tuesday, a half hour appointment on a Wednesday, and a half hour appointment on a Friday, all within the same week.

Participants were randomly assigned to one of 16 experimental conditions.¹ The study's $2 \times 2 \times 2$ experimental design produced eight total treatment conditions. To control for order effects, however, the order of presentation was varied. Participants in the $3\times$ condition viewed three television shows in one of two orders: A-B-C or C-B-A. The stimulus showed to participants in the $1\times$ condition was varied as well, with those participants viewing either episode A or C.

The activities that participants engaged in during each of their appointments varied depending on the experimental condition to which they were randomly assigned. Participants in the $3\times$ exposure condition, for example, were exposed to violent media on Monday, Tuesday, and Wednesday. Participants in the $1\times$ exposure condition were exposed to violent media on Monday only. Because all participants attended on all four days regardless of experimental conditions, these participants were given filler activities on

Tuesday, Wednesday, and Friday. For participants in the immediate condition, the dependent variables were administered immediately following their final exposure to violence. For participants in the delayed condition, the dependent variables were administered 48 hours following their final exposure to violence (i.e., Fridays for the 3× condition, and Wednesdays for the 1× condition).

Each day, participants reported to a laboratory on campus containing five individual viewing cubicles. Each cubicle held a table, chair, and desktop computer. Participants viewed the violent programs from the computer desktop alone in a cubicle. The study's dependent variables were measured on the appropriate day (e.g., immediately following their final violence exposure or after a 48 hour delay—depending on experimental condition) via a computer-based questionnaire. Immediately after completing the dependent variables, all participants filled out a pen-and-pencil questionnaire measuring control variables before leaving.

Participants

Participants were undergraduate students at a West Coast university who were recruited from introductory communication courses and received course credit for their participation. All guidelines set forth by the Human Subjects Committee were followed and approval for use of human subjects was obtained. A total of 239 students signed up to participate. Data from 20 participants had to be dropped due to attendance problems; furthermore, data from 6 participants were dropped due to technical problems. In the end, data from 213 students were retained and used. The sample had an average age of 19.59 years ($SD = 1.64$), and a majority of the sample was female (73.7%). The majority of participants identified themselves as being White/Caucasian (59.5%), with only 12.9% represented by Asian Americans, 14.3% by Latinos, 3.8% by African Americans, and 9.5% who selected “other” as their ethnic background.

Stimulus Materials

All stimulus materials were shortened episodes of the FX television show “The Shield,” a Los Angeles-based police drama known for its controversial and explicit portrayal of morally challenged and often corrupt police officers. Three separate episodes of “The Shield” were used in the present study (episodes A, B, and C). To minimize subject attrition and fatigue, episodes were edited to a length of approximately 20 minutes. Nonrelevant story lines were removed from the original hour-long episodes, resulting in the presentation of characters and action only directly related to the central plot line. There were no commercial breaks within the episodes.

Independent Variables

FREQUENCY OF EXPOSURE

Participants were exposed to either one or three of the 20-minute episodes described above. The comparison between one and three exposure levels is consistent with prior research into chronic accessibility (Weiss, Chalupa, Gorman, & Goodman, 1968) and desensitization (Mullin & Linz, 1995).

VIVIDNESS

The level of vividness was manipulated by editing out vivid content from each of the original 20-minute episodes. Three strategies were undertaken to edit out vivid content from the original episodes, guided by Nisbett and Ross' (1980) definition for vividness described above. To align with the proximity portion of the vividness definition, close-up shots of violence were edited out. For example, one episode contained a scene in which police officers push a criminal's face onto a hot stove. In the vivid version, viewers saw a close-up of the man's face burning on the stove. In the nonvivid version, viewers saw the man's face lowering down toward the stove, but then the scene cut to a long shot of the two men hovering over the stove; thus, nonvivid viewers never actually saw the man's face on the stove. To align with the second portion of the vividness definition, images that were concrete and imagery provoking were removed. In the case of violence, images that were likely to be imagery provoking are those containing blood and gore. For example, one episode showed police officers beating a criminal to the point that he spit out blood and teeth. In the nonvivid version of that episode, the portion where he spit out the blood and teeth is edited out. Finally, to align with the emotionally interesting portion of the vividness definition, emotional reactions to violent acts were removed. This includes screams, moans, gasps, and yelling. For example, one episode's vivid version included the screams and yells of victims who have been lit on fire. In the nonvivid version, most of the screams and yells are edited out. All editing maintained the integrity of scenes and plotlines. Each of the nonvivid versions was only one minute shorter than its 20-minute, vivid counterpart.

A pilot study was conducted to perform a vividness manipulation check. Participants in the pilot study were 203 undergraduate students who viewed one of the six episodes (episodes A, B, and C in vivid or nonvivid formats) in groups of five to seven students. After viewing, participants filled out a questionnaire where they made ratings based on the show's vividness and overall violence. Participants in the pilot study were asked to rate vividness on a 5-point scale (1 = *not at all vivid*, 5 = *very vivid*), and were then prevented from participating in the main experiment.

Results from an independent samples *t* test reveal that the vivid versions of episodes A and C were rated as being significantly more vivid than the

nonvivid counterparts, $t(28) = 4.07$, $p < .001$, and $t(44) = 3.03$, $p < .01$, respectively. When comparing the vivid and nonvivid version of episode B, the difference is nearing significance, $t(27) = 1.78$, $p = .086$. An inspection of means shows that the difference is in the right direction, with the vivid version being rated as more vivid ($M = 4.00$, $SD = .81$) than the nonvivid version ($M = 3.50$, $SD = .69$). Therefore, the manipulation of vividness appears to have been successful.

RECENCY OF EXPOSURE

The dependent variables were assessed either immediately after exposure to “The Shield” or after a delay. The delayed measures were assessed 48 hours after the initial exposure, consistent with prior research exploring the delayed effects of vividness (Shedler & Manis, 1986).

Dependent Variables

After watching their final violent episode, participants completed the dependent measures on a personal computer. After being logged into the questionnaire by the researcher, participants were given instructions before proceeding to the questionnaire. The questionnaire consisted of baseline questions and 23 social reality questions. The two dependent variables were the reaction times to the social reality questions (i.e., accessibility) as well as their answers to the questions (i.e., social reality beliefs). After completing the computer-based questionnaire, participants filled out a pen-and-paper questionnaire measuring the control variables.

ACCESSIBILITY

Consistent with prior research, accessibility was measured through reaction times using the SuperLab 4.0 software on a personal computer. Participants were instructed to answer the questions both quickly and accurately, consistent with prior research (Fazio, 1990). Participants were instructed to enter numeric responses only with their dominant hand into the number pad portion of the keyboard.

Following the instructions, participants were presented with six baseline questions taken from prior research (Shrum, 1996; Shrum & O’Guinn, 1993). Participants were next presented with five questions designed to give participants more time to practice the procedure. Following these five orienting questions, participants were presented with 23 questions measuring social reality beliefs. Reaction times were measured as the time between the presentation of each social reality question and the first key press of the answer.

SOCIAL REALITY BELIEFS

Social reality beliefs were measured through the use of 23 prevalence estimate questions, which asked participants to estimate the prevalence of crime and violence in society. Nineteen questions from prior cultivation research were asked (e.g., Nabi & Sullivan, 2001; Shrum, 1996; Shrum & Bischak, 2001; Shrum et al., 1998). In addition to these established questions, some new questions were created specifically for use in the present study to align with issues of police morality that were addressed in the episodes of "The Shield." For instance, one question asked, "What percentage of American police officers is racist?" and another asked, "What percentage of L.A. cops is dishonest?"

Control Variables

Although random assignment should ensure equality among the various experimental conditions, it is important to control for any extraneous variables that might account for variance in the dependent variable. In a study exploring the effects of frequency and recency, it is important to verify that the experimental conditions are, in fact, equal in terms of their frequent and recent use of television as well as other potentially violent media. Therefore, the pen-and-paper questionnaire participants filled out after completing the dependent variables asked a series of questions about their frequent and recent media use. First, participants were asked to state the number of hours of television they had watched on that day; second, participants were asked to state the number of hours of television they watch in an average week in a series of day parts; third, participants were asked to state the number of hours in the average week they spend using media other than television (i.e., newspapers, books, magazines, internet, and radio).

RESULTS

Data Reduction

SOCIAL REALITY BELIEFS

Although the distributions of all 23 prevalence item questions demonstrated a slight positive skew, skew and kurtosis values for two of the questions fell outside acceptable ranges (Kline, 2005) even after the removal of outliers and performing transformations.² Therefore, these two questions were removed from all analyses.

The remaining 21 prevalence estimate questions were subject to a principal component factor analysis with varimax rotation. Although six factors emerged accounting for 66% of total variance, factors 5 and 6 had only one

item that loaded on each of them. The factor analysis was rerun forcing 5 factors, which accounted for 61% of total variance. Factor items required primary loadings of .50 and secondary loadings below .40 to be retained. Factor 1 consists of five items measuring the prevalence of crime and violence in society in general (e.g., "What percentage of people is the victim of a gunshot in their lifetime?"). Factor 2 consists of three items related to police immorality, consistent with the content portrayed in the stimulus materials (e.g., "What percentage of L.A. cops is dishonest?"). Factor 3 consists of three items related to one's likelihood of personally being involved in crime (e.g., "What are the odds (in %) that you personally will be attacked or robbed within the next year?"). Factor 4 consists of three items measured through raw estimates focusing on the number of violent acts in various locations (e.g., "How many murders took place in L.A. in 2006?"). Factor 5 had only one item that loaded cleanly and, therefore, was not used in any further analyses.

Based on the four factors, four separate prevalence estimate scales were created: one representing beliefs about general crime prevalence ($\alpha = .86$), one representing beliefs about police immorality ($\alpha = .74$), one representing beliefs about personal crime susceptibility ($\alpha = .78$), and one representing beliefs about crime in specific locations ($\alpha = .57$). The low reliability on the three-item scale regarding crime in specific locations was a concern and, therefore, this scale was not used in any further analyses. Therefore, for all analyses in the present study, three prevalence estimate scales are used:³ a general crime belief scale ($M = 0.01$, $SD = .84$), a police immorality scale ($M = 28.9$, $SD = 19.1$), and a personal susceptibility scale ($M = -.002$, $SD = .83$). The first and third scales (general crime belief scale and personal susceptibility scale) were formed using z scores so that raw data could be pooled with data on which logarithmic or square root transformations had been performed.⁴ The police immorality scale was created by averaging the original raw data (i.e., percentages), since no transformations were performed on the three items that comprise this scale. On this scale, higher numbers indicate higher perceptions of immorality. Means and standard deviations for the questions that comprise each scale are displayed in Table 1.

ACCESSIBILITY

Before testing the hypotheses, several analyses were performed on the reaction time data. First, a baseline index was calculated by computing the within-subject average of the six baseline questions. This baseline was subsequently used as a covariate in all analysis of covariance (ANCOVA) analyses.

The reaction time data were next analyzed to determine the presence of outliers. As is often the case (Fazio, 1990), some participants in the present study exhibited extremely slow reaction times to some questions and, therefore, the data were positively skewed. Prior research has advocated for

TABLE 1 Summary of Descriptive Statistics for Prevalence Estimate Scales

	<i>M</i>	<i>SD</i>	Range
General Crime Scale ($\alpha = .86$)			
1. What % of people is the victim of a gunshot in their lifetime?	12.7	12.1	0–60.0
2. What % of women is raped in their lifetime?	24.1	19.4	0.1–90.0
3. What % of Americans has been the victim of a violent crime while jogging after dark?	15.0	16.0	0–77.0
4. What % of Americans has used the services of a prostitute?	21.1	18.8	0–90.0
5. What % of American women has been the victim of domestic violence?	28.6	20.4	0–90.0
Police Immorality Scale ($\alpha = .74$)			
6. What % of American police officers is racist?	27.5	22.4	0–100.0
7. What % of L.A. cops is dishonest?	26.4	22.1	0–95.0
8. What % of American police officers has used unnecessary force when making arrests?	32.5	25.5	0–100.0
Personal Susceptibility Scale ($\alpha = .78$)			
9. How likely is it (in %) that you will have your house broken into during the next year?	9.1	12.6	0–77.0
10. What are the odds (in %) that you personally will be attacked or robbed within the next year?	9.3	12.6	0–50.0
11. If you spent a month in New York City, what are the chances (in %) of being involved in a violent crime?	11.3	13.6	0–65.0

Note. Under the general crime scale, question 3 had to be transformed using a square root due to skewed data. The data in the above chart reflect the raw scores before the square root transformation. The same is true for question 10 under the Personal Susceptibility scale, the question about the odds of being attacked or robbed within the next year.

the recoding of reaction times greater than two (Shrum & O'Guinn, 1993) or three (Smith, Fazio, & Cejka, 1996) standard deviations from the mean as missing data. To avoid eliminating legitimately slow or fast reactors from the present data set, reaction times greater than four standard deviations from the mean were coded as missing data. Doing so eliminated 24 data points, or less than 1% of the reaction time data.

Shrum and O'Guinn (1993) argued that participants should not be able to respond faster to any of the prevalence estimate questions than they did to the question "How old are you?" and, therefore, reaction times smaller than baseline represent errors. In the present study, there were 36 instances in which a participant's reaction time to a prevalence estimate question was faster than their average of the first three baseline questions (the three easiest baseline questions). Further inspection of these 36 instances revealed that for 13 of them, the participant did not provide an actual answer to the prevalence estimate question (i.e., they pressed the space bar). Therefore, these data points were coded as missing data. For the remaining 23 instances,

TABLE 2 Summary of Descriptive Statistics for Reaction Time Scales

	<i>M</i>	<i>SD</i>	Range
Reaction time scales:			
General Crime scale	6047.4	1573.2	3028.0–12880.7
Police Immorality scale	5615.3	1402.6	2257.7–10400.0
Personal Susceptibility scale	6443.9	1781.0	1885.7–11317.7

Note. Data for the reaction time scales are in milliseconds.

participants provided a legitimate and valid response to the prevalence estimate question and were included.

After recoding the above data as missing, skewness and kurtosis values for the reaction times to all 23 prevalence questions fell within acceptable ranges and no further transformations were performed. Three reaction time scales were created to align with the three factors that emerged from the prevalence estimate data: reaction times to questions about crime in general, reaction times to questions about police immorality, and reaction times to questions about personal susceptibility (see Table 2 for descriptive statistics).

Finally, reaction time scores were compared to prevalence estimate answers to determine whether fast reaction times were associated with response extremity. As Shrum and O'Guinn (1993) acknowledged, such a relationship may be an indicator of participant confidence, which could confound any conclusions about accessibility. In the present study, for only one question (see question 9 in Table 1) were reaction times correlated with the content of the responses, $r = .21$, $p < .05$. Given that the remaining questions show no relationship between reaction times and extremity of response, this one positive correlation was not a concern.

Controlling for Order Effects

Prior to testing the hypotheses, the data were first checked for the presence of order effects. Results suggested that order of presentation mattered for some of the prevalence estimate questions.⁵ Therefore, in all subsequent analyses presentation order was included as a covariate.

Analyses of Hypotheses and Research Questions

HYPOTHESES 1A AND 1B

Hypothesis 1a predicts a main effect for frequency on accessibility and was tested using the three reaction time scales discussed above: reaction times for general crime, reaction times for police immorality, and reaction times for personal susceptibility. The three reaction time scales were subjected to three separate 2 (frequency) \times 2 (vividness) \times 2 (recency) between-subjects

TABLE 3 Estimated Marginal Mean Scores for Main Effects on Reaction Times (Hypothesis 1a through Hypothesis 3a)

	General crime		Police immorality		Personal susceptibility	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Frequency						
1×	6071.7	141.7	5639.1	122.7	6330.6	156.5
3×	6081.2	168.2	5571.7	145.6	6582.2	185.8
Recency						
Immediate	6040.3	148.1	5572.9	128.2	6416.9	163.6
Delay	6112.5	165.6	5637.8	143.4	6495.9	182.9
Vividness						
Vivid	6142.7	267.7	5707.1	231.8	6557.2	295.8
Nonvivid	6010.2	265.3	5503.6	229.7	6355.7	293.1

Note. All data reported in milliseconds.

ANCOVAs with presentation order, baseline reaction times, weekly television viewing, television viewing today, and other media viewing entered as covariates. Mean scores are displayed in Table 3. The results of the between-subjects ANCOVA yielded no main effect for frequency on accessibility of thoughts for any of the three reaction time scales: reaction times for general crime, $F(1, 192) = .002$, $p = .97$, $\eta^2 = .000$, reaction times for police immorality, $F(1, 192) = .12$, $p = .73$, $\eta^2 = .000$, and reaction times for personal susceptibility, $F(1, 192) = 1.06$, $p = .31$, $\eta^2 = .000$. Therefore, Hypothesis 1a is not supported.

Hypothesis 1b predicts a main effect for frequency on social reality beliefs and was tested using the three prevalence estimate scales discussed above: general crime beliefs, police immorality beliefs, and personal susceptibility beliefs. Once again, the three scales were subjected to three separate 2 (frequency) \times 2 (vividness) \times 2 (recency) between-subjects ANCOVAs with four covariates: presentation order, weekly television viewing, television viewing today, and other media viewing. Mean scores are displayed in Table 4. Once again, there was no main effect for frequency on any of the three prevalence estimate scales: general crime beliefs, $F(1, 193) = .72$, $p = .40$, $\eta^2 = .003$, police immorality beliefs, $F(1, 193) = 1.07$, $p = .30$, $\eta^2 = .001$, and personal susceptibility beliefs, $F(1, 192) = .002$, $p = .97$, $\eta^2 = .000$. Therefore, Hypothesis 1b is not supported.

HYPOTHESES 2A AND 2B

Hypothesis 2a predicted a priming effect, or a main effect for recency on accessibility. The three reaction time scales were subject to three separate $2 \times 2 \times 2$ between-subjects ANCOVAs with the same five covariates used in Hypothesis 1a. Once again, there were no main effects for recency on

TABLE 4 Estimated Marginal Mean Scores for Main Effects on Prevalence Estimates (Hypothesis 1b through Hypothesis 3b)

	General crime		Police immorality		Personal susceptibility	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Frequency						
1×	−.06	.07	27.5	1.7	.00	.08
3×	.04	.09	30.2	1.9	.01	.09
Recency						
Immediate	.10 _a	.08	31.5 _b	1.7	−.02	.08
Delay	−.12 _a	.08	26.2 _b	1.9	.02	.09
Vividness						
Vivid	.15	.14	36.2 _c	3.2	.29 _a	.15
Nonvivid	−.18	.14	21.5 _c	3.1	−.29 _a	.15

Note. Data for the general crime and personal susceptibility scales are based on *z* scores. Means with matching subscripts differ significantly at the $p \leq .05$ level.

reaction times to any of the three scales (see Table 3 for mean scores). Therefore, Hypothesis 2a is not supported.

There was, however, a main recency effect for two of the three prevalence estimate scales. Once again, the three prevalence estimate scales were subject to three separate $2 \times 2 \times 2$ between-subjects ANCOVAs with the same four covariates used in Hypothesis 1b. There was a main effect for recency on participants' general crime beliefs, $F(1, 193) = 3.70, p = .056, \eta^2 = .02$. As Table 4 depicts, participants' estimates of the prevalence of crime in general were higher when asked immediately following exposure to media violence ($M = .10, SD = .08$) than when asked after a delay ($M = -.12, SD = .08$), although the effect was only marginal ($p = .056$). There was also a priming effect found on people's beliefs about police immorality, $F(1, 193) = 4.17, p < .05, \eta^2 = .01$. Once again, an analysis of estimated marginal means shows that estimates about the prevalence of police immorality were higher ($M = 31.5, SD = 1.74$) when dependent measures were taken immediately following exposure to violence than after a delay ($M = 26.2, SD = 1.94$). There was no main effect for recency on personal susceptibility beliefs. Therefore, Hypothesis 2b is partially supported.

HYPOTHESES 3A AND 3B

Hypothesis 3a predicted a main effect for vividness on accessibility. Once again, three separate ANCOVA analyses show no main effect for vividness on any of the three reaction time scales. Therefore, Hypothesis 3a is not supported.

There was, however, a main effect for vividness on two of the three prevalence estimate scales: beliefs about police immorality, $F(1, 193) = 6.48, p < .05, \eta^2 = .01$, and beliefs about personal susceptibility, $F(1, 192) = 4.76,$

$p < .05$, $\eta^2 = .02$. As Table 4 shows, estimates about the prevalence of police immorality and estimates about personal susceptibility to crime and violence are higher in the vivid conditions than in the nonvivid conditions. There was no main effect for vividness on general crime beliefs, however. Therefore, partial support was found for Hypothesis 3b.

RESEARCH QUESTIONS 1A AND 1B

Research Question 1a asked how frequency and vividness would interact to impact accessibility. An ANCOVA showed a significant interaction between frequency and vividness on reaction times to questions about general crime, $F(1, 192) = 4.07$, $p < .05$, $\eta^2 = .001$. A follow-up pairwise comparison of means analysis, however, shows that none of the means are significantly different from the other. Two further ANCOVA analyses showed no interaction effect between vividness and frequency on reaction times to policy immorality or personal susceptibility questions.

With regard to social reality beliefs, there was a significant interaction between vividness and frequency on two of the three prevalence estimate scales: general crime beliefs, $F(1,193) = 3.66$, $p = .057$, $\eta^2 = .02$, and police immorality beliefs, $F(1,193) = 6.24$, $p < .05$, $\eta^2 = .01$. The general crime belief interaction is displayed in Figure 1. A pairwise comparison of means shows that the at the 3× exposure frequency, estimates of the frequency of crime in general are higher in the vivid ($M = .31$, $SD = .17$) than the nonvivid ($M = -.24$, $SD = .16$) condition, although the effects are only nearing significance, $p = .056$. In the 1× viewing condition, there is no difference between prevalence estimates between the vivid and nonvivid conditions. A second pairwise comparison of means analysis shows that within the vivid condition, estimates of crime prevalence in general are higher in the 3× viewing condition than they are in the 1× viewing condition ($M = -.01$, $SD = .15$), $p = .054$. In the nonvivid version, there is no difference in prevalence estimates for general crime when comparing the 1× vs 3× frequency levels.

The same pattern emerges in Figure 2, which depicts the police immorality interaction. Once again, when viewing vivid violence, estimates of the prevalence of crime in general are significantly higher in the 3× frequency condition ($M = 40.75$, $SD = 3.82$) than in the 1× frequency condition ($M = 31.56$, $SD = 3.50$), $p < .05$. In the nonvivid condition, a pairwise comparison of means shows no difference between the 1× and 3× viewing levels. Once again, participants within the 3× viewing level rated prevalence estimates of police immorality higher in the vivid than in the nonvivid version ($M = 19.62$, $SD = 3.78$), $p < .05$. In the 1× viewing condition, estimates of police immorality do not vary from the vivid to nonvivid versions.

Finally, there was no interaction effect between vividness and frequency on beliefs about personal crime susceptibility.

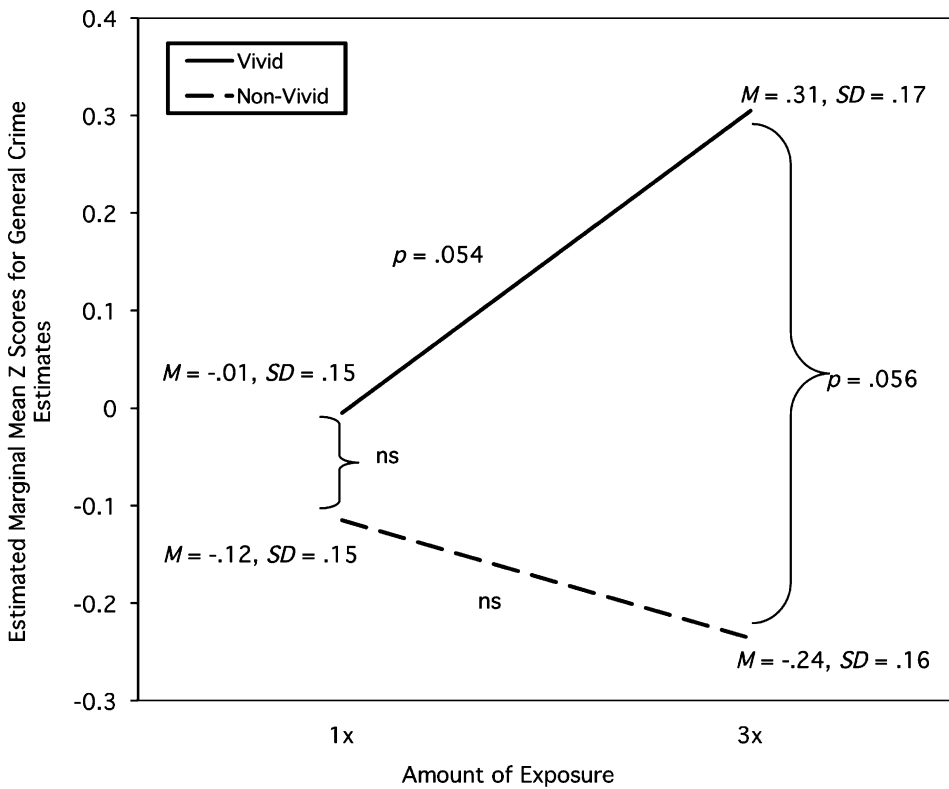


FIGURE 1 Interaction between vividness and frequency on beliefs about the prevalence of crime in general. $F(1,193) = 3.66, p = .057$.

RESEARCH QUESTIONS 2A AND 2B

Research Questions 2a and 2b asked about the comparative impact of frequency and recency on accessibility (RQ2a) and social reality beliefs (RQ2b). To analyze Research Questions 2a and 2b, only participants in the 1× immediate or 3× delay condition were selected. A new variable (condition) was created that coded participants as either 1 (1× immediate) or 2 (3× delay). A series of ANCOVA analyses were run using the same covariates in the analyses above, using the new condition variable as the sole independent variable. In all analyses, there were no significant differences in accessibility or prevalence estimates when comparing participants in the 1× immediate and 3× delayed condition.

DISCUSSION

Prior research using correlational data has found consistent support for the heuristic processing model of cultivation. For the first time, the present study

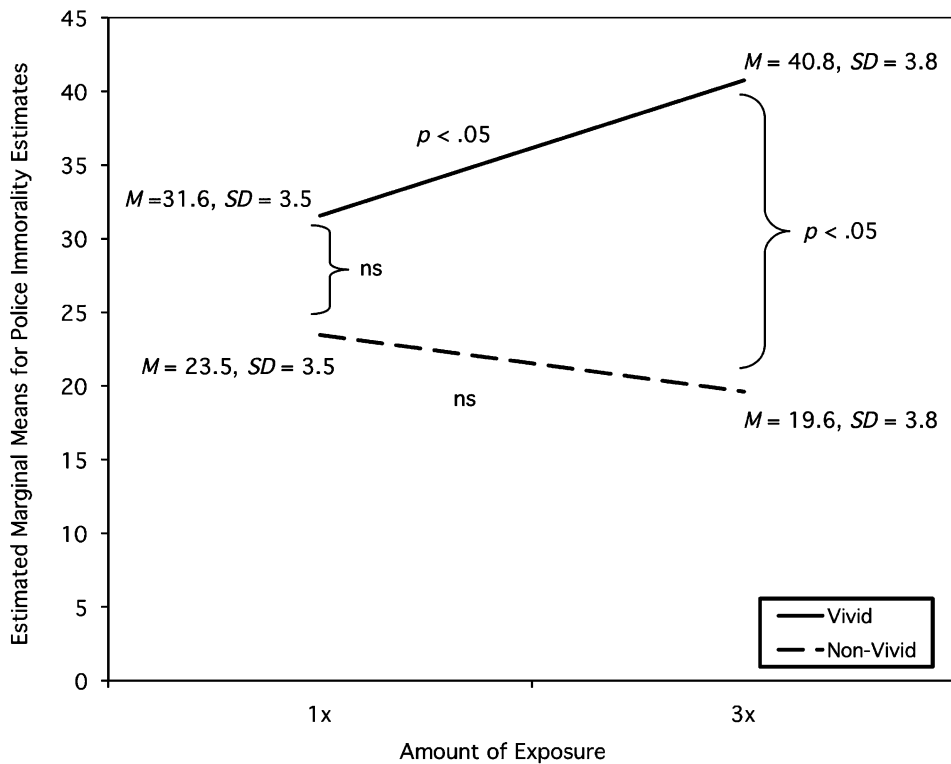


FIGURE 2 Interaction between vividness and frequency on beliefs about the prevalence of police immorality. $F(1,193) = 6.24, p < .05$.

employed a prolonged exposure experiment to test the model. The findings of this study suggest that a) frequent exposure to vivid violence increases participants' estimates of crime and violence, b) prevalence estimates of crime and violence decline after a 48-hour delay, c) the verdict is still out on the role that accessibility plays in the cultivation process, and d) social reality beliefs directly related to the content of media viewed were most consistently affected by exposure.

Perhaps the most interesting finding in the present study is the significant interaction between frequency and vividness on social reality beliefs pertaining to crime in general and police morality. In both cases, frequent exposure to vivid violence led to an increase in estimates of the prevalence of crime. When the violence was not vivid, however, repeat exposure did not lead to a similar increase. Furthermore, estimates of crime and violence prevalence did not differ at the 1x level between the vivid and nonvivid versions. The findings of the present study, therefore, suggest that people are most affected by vivid media violence when they are exposed to it repeatedly. Thus, a heavy diet of violence using close-up shots with graphic depictions of blood,

gore, and emotional reactions by victims will affect participants' perceptions of real-world violence over time.

Interestingly, however, this used to be the type of violence that was rarely shown on television. Content analyses from the 1990s showed that the television landscape, although violent, tended to be nongraphic and not explicit ("National television violence study," 1998). In particular, the NTVS studies found that close-up shots of violent acts were rare on television, as were depictions of blood and gore. As such, decades of cultivation studies that found a small but significant correlation between television viewing and beliefs about the prevalence of crime and violence in the real world were based primarily on viewers' repeat exposure to nonvivid violence. Future cultivation studies may want to consider not only the presence of violence in people's television diets, but also the level of vividness of those portrayals. To do so may require an updated, large-scale content analysis of televised media violence that codes for graphicness or vividness, especially given the influx of newer programs produced specifically for cable, such as "The Shield" or "The Sopranos."

There was also a significant main effect for recency on two of the three social reality belief measures: beliefs about crime in general and beliefs about police immorality. In both cases, participants who were asked the questions immediately following violence exposure gave higher estimates of crime and immorality than participants who were asked 48 hours later. These findings support prior research demonstrating the ability for media violence to impact thoughts, attitudes, and emotions in the short term (Anderson et al., 1998; Carnagey & Anderson, 2005; Tamborini et al., 1984), but has never been demonstrated using social reality beliefs as an outcome variable. These findings suggest, therefore, that the cultivation effect may dissipate over time in the absence of exposure to recent media violence.

Neither recency nor the frequency by vividness interaction had any impact on the third prevalence estimate scale: beliefs about personal crime susceptibility. This finding, however, is actually consistent with recent cultivation research (e.g., Shrum & Bischak, 2001) that has drawn from the impersonal impact hypothesis (Tyler & Cook, 1984) to distinguish between personal and societal level risk perceptions. Tyler and Cook argue that people form personal and societal level risk perceptions in different ways and that indirect experience gained through the media is less likely to impact personal risk perceptions. Indeed, Shrum and Bischak (2001) found that people's television-viewing levels are related to societal level risk perceptions but not personal risk perceptions. A similar pattern of findings emerged in the present study as well.

Another key finding of the present study is that frequency, recency, and vividness did not have any meaningful impact on accessibility as measured through reaction times. Although there was a significant frequency by vividness interaction on one of the reaction time scales (general crime), this

finding likely occurred due to chance and does not appear to reflect any meaningful patterns in reaction time data. The findings of the present study, therefore, do not support prior research into the heuristic processing model: reaction times to questions assessing prevalence estimates did not vary as a function of media exposure in this experimental setting.⁶

It is still too soon, however, to make any definitive conclusions regarding the role that accessibility plays in the cultivation process. It is interesting to note that the reaction times collected in the present study (averaging 5–6 seconds per question) are noticeably higher than those collected in prior studies by Shrum and colleagues (3–4 seconds per question; O’Guinn & Shrum, 1997; Shrum, 1996). Because the procedures followed in the present study mimicked those of Shrum’s research, and the prevalence estimate questions were often the same exact questions, it is difficult to explain the difference in reaction times. It is possible that differences in software or hardware are responsible for the discrepancy, or perhaps it amounts to differences in the samples employed. Given the discrepancy, it is premature to make any conclusions about accessibility.

Future research, therefore, should continue to look at the impact of frequency, recency, and vividness on construct accessibility in an experimental context. This research, however, may benefit from the use of alternative measures of accessibility. As two reviewers of this manuscript pointed out, the accessibility measures employed in tests of the heuristic processing model are not true measures of accessibility; that is, they not only measure accessibility, but also the decision time participants may need to answer lengthy prevalence estimate questions. Researchers who study implicit attitudes and stereotypes, on the other hand, typically measure accessibility by timing participants’ split-second reactions to single words (e.g., Fazio, Herr, & Powell, 1992) or a picture (e.g., Eberhardt, Goff, Purdie, & Davies, 2004) shown on screen for only a few milliseconds. Future heuristic-processing research, therefore, may benefit by adopting some of these measures of accessibility.

Interestingly, out of the three prevalence estimate scales used in this study, the police immorality scale was the one most often affected by frequency, vividness, and recency. The questions in this scale asked about racism, honesty, and the use of unnecessary force by police officers. Thus, each of the questions directly reflected issues that were depicted in the episodes of “The Shield” seen by participants, and created the scale that most frequently varied as a function of the independent variables. When this scale was used as the dependent variable, a main effect was found for both vividness and recency. There was also a significant frequency by vividness interaction. Finally, an inspection of the reaction time data in Tables 2 and 3 shows that reaction times to questions about police immorality were always faster than reaction times to questions about general crime and personal susceptibility. Paired sample *t* tests reveal that these differences are significant at the $p < .01$ level. That is, participants’ reaction times to questions about police

immorality were significantly faster than their reaction times to questions about crime in general or personal crime susceptibility. Although no a priori predictions were made about it, this finding appears to provide some support for accessibility, that is, thoughts about media content actually seen by participants appear to have been more accessible than thoughts about crime and violence in general. This supports the heuristic processing model, which argues that viewing television violence leaves related constructs accessible in memory.

Finally, the results of the present study were unable to resolve any debate concerning the relative contributions of frequency and recency on social reality beliefs. For all three prevalence estimate scales, there was no difference between information seen frequently but not recently and information seen recently but not frequently. The same was true for reaction times. Therefore, the frequency versus recency debate continues.

Limitations

The present study had some limitations that must be acknowledged. More robust results may have been found if participants in the high frequency condition had been exposed at the 5× or 10× frequency level, rather than a 3× level. Although the comparison of the 3× and 1× exposure levels has precedence in the chronic accessibility literature, it is possible that the 3× exposure level is not sufficient to affect the accessibility of thoughts in memory.

As stated above, the reaction time measure used in the present study may not be the most appropriate way of assessing accessibility. Not only did participants have to respond to somewhat long questions that asked for their estimates of crime and violence, they also had to respond to a long list of such questions. The present study asked 23 prevalence estimate questions, which came after a series of baseline and warm-up questions. Thus, it is possible that participants were suffering from fatigue toward the end of the 23 prevalence estimate questions.

Conclusion

The results of this project suggest that television violence does in fact have a direct causal impact on participants' social reality beliefs. In particular, repeat exposure to vivid violence leads to an increase in people's societal-level estimates about the prevalence of crime and violence in the real world. Given participants' reactions to vivid television violence seen frequently, one must wonder if the findings extend to other media that may include vivid depictions of violence, such as violent video games. Consistent with prior research, exposure to media violence did not appear to have a significant

impact on people's perceptions of personal susceptibility to crime. Additionally, the effects of television violence in this study tended to decrease after a 48-hour delay.

Despite the findings of the present study, the heuristic processing model still holds promise as an explanatory mechanism for the cultivation effect. At its very core, the model predicts that people process heuristically when constructing judgments about the prevalence of crime and violence in society. Future studies should try to learn more about the shortcuts people use when they construct social reality judgments about real-world crime and violence, as well as the impact of television viewing on those shortcuts. Perhaps people employ an availability heuristic, or perhaps they employ a different heuristic. Indeed, Shrum (2001) has suggested that the *representative* (Kahneman & Tversky, 1972) heuristic may be responsible for the cultivation effect. Future research needs to explore the strategies people undertake when asked to state the frequency of real-world violence to learn more about the cultivation process.

NOTES

1. There was also a no exposure control group that led to an experimental design that was not fully nested. Because there were only 10 participants in this control group, the no exposure control group was not included in any of the analyses.
2. Initially, skew and kurtosis values for 11 of the prevalence estimate questions fell outside acceptable ranges (Kline, 2005). Tabachnick and Fidell (2001) argue that standardized scores greater than 3.29 standard deviations from the mean are potential outliers. To be extra cautious in the present study, only scores that were greater than four standard deviations from the mean were recoded as missing data. After removing these extreme outliers ($n = 35$), the revised frequency distributions for nine of the questions were still skewed positively. A square root transformation reduced the skewness problem for four of the items, and a logarithmic transformation reduced the skewness problem for four more items. The remaining two prevalence estimate items were removed from analysis when no transformations could reduce the skewness problem.
3. Based on the factor analysis, the amount of variance explained by these three factors was 45%.
4. The range of possible responses for the general crime and personal susceptibility scales ranged from 0 to 100. If the means were not transformed into z scores, the raw data averages would be as follows: general crime belief scale ($M = 20.58$, $SD = 14.84$), personal susceptibility scale ($M = 9.70$, $SD = 10.11$).
5. To determine whether or not any differences occurred when watching episode A or C last, data from participants in the vivid and nonvivid conditions were subjected to three separate independent samples t tests. Order of presentation was the independent variable, and prevalence estimates about crime in general, police morality, and personal beliefs were the three separate dependent variables. In the vivid condition, the order of presentation had no impact on participants' scores when employing prevalence estimates about general crime beliefs or police morality as the dependent variable. There was, however, an effect for presentation order that was nearing significance on prevalence estimates about personal crime susceptibility, $t(107) = -1.87$, $p = .064$. An analysis

of means showed that prevalence estimates about personal crime susceptibility were higher when participants viewed episode A last than when they saw episode C last. In the nonvivid viewing conditions, there was an effect nearing significance for order on prevalence estimates about general crime, $t(102) = -1.87$, $p = .065$. Once again, prevalence estimates were higher when participants viewed the nonvivid episode A last. There was also a significant effect for presentation order on prevalence estimates of police immorality, $t(102) = -2.82$, $p < .01$. Once again, prevalence estimates were higher when participants watched the nonvivid episode A last. There was no effect for presentation order on the personal crime susceptibility scale.

6. The heuristic-processing model, more specifically, argues that accessibility *mediates* the relationship between television exposure and social reality beliefs. Because there were no effects for accessibility at all, no tests were performed to determine whether or not it mediates the relationship between exposure and social reality beliefs.

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