

ATTITUDE CHANGE AND SOURCE MONITORING ERRORS FOLLOWING
IMAGINED SCENARIOS OF ATTITUDE-RELEVANT INTERACTIONS

by

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ATTITUDE CHANGE AND SOURCE MONITORING ERRORS FOLLOWING
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“The memory of some past moments is more persuasive
than the experience of present ones.”

Henry David Thoreau (1817-1862)

March 2, 1842, Letter to Lucy Brown

In the way that only a poet can, Thoreau beautifully described a simple phenomenon that many have experienced. Our memory can have an immense impact on our current thoughts, feelings, and behaviors. As memory does not always accurately reflect the past, errors in memory are just as likely to affect our current lives.

The Source Monitoring Framework (SMF; Johnson, Hashtroudi, & Lindsay, 1993; Johnson & Raye, 1981) posits that memory errors can arise from source confusions regarding memories of events. For instance, when recalling a conversation with several friends, we may have trouble remembering exactly who made a certain comment. Moreover, it is possible to attribute a statement to the wrong person. Source confusions may also follow *imagining* an event. Think about getting ready to go to work on a typical morning and reminding yourself to lock the back door before heading out. Later in the day, a source monitoring error may occur when you have trouble discerning whether you actually went to lock the door or only imagined yourself locking it (Lindsay & Johnson, 2000).

The key principle of the SMF lies in the details associated with a particular event in one’s memory. According to Johnson and her colleagues, there are key differences between

the memories of real and imagined events. Real events are believed to include a great deal more perceptual detail. These memories also include greater amounts of information regarding the thoughts and feelings of the individual as they were experiencing the event. Memories of imagined events, however, include very different information. Here, the event in memory is also associated with the cognitive processes that were responsible for the creation of the imagined event. When an imagined event includes a level of detail that more closely matches what one would expect from a “real” memory, source monitoring errors are more likely to occur. The types of associations formed when events are stored in memory, therefore, play an important role in how the events will be remembered. Imagined events that include more perceptual information and less information associated with the creation process would be more likely to lead to memory errors where the source of the event is believed to lie in reality rather than imagination (Johnson, Foley, Suengas, & Raye, 1988; Mitchell & Johnson, 2000).

The basic assumption that many people hold that memory is generally correct and accurate also plays an important role in the creation of memory errors (Brainerd & Reyna, 2005). Once a memory error has occurred, it can often be difficult to resolve. When an imagined event is incorrectly recalled as an accurate account of an experienced event the memory is further distanced from associations that link the memory to cognitive processes relating to the formation of the imagined event (Johnson et. al, 1988; Johnson et. al, 1993).

Many attitude theories hold that our current attitudes are, at least in part, based on our memories of past actions (Bem, 1967; Festinger, 1957; Lord & Lepper, 1999). These theories maintain that when reporting one’s evaluation of a given attitude object, an individual looks back at the actions he or she has taken in the past to help inform, and provide evidence for,

the current attitude report. If past behaviors impact current attitudes, it seems as though errors in remembering past behaviors would have a similar impact. Whether or not the memory of an event is accurate may play a small role in its impact on an attitude as long as the event is sufficiently associated with the attitude in memory.

McIntyre, Lord, Lewis, and Frye (2004) tested the possibility that memory errors can directly impact attitudes. McIntyre and his colleagues (2004) asked students to write hypothetical scenarios in which they acted in either positive or negative ways toward several gay men. The situations were based on actions that the students had previously denied having ever taken toward a gay man. Writing the hypothetical scenarios led many students to report source monitoring errors in which they falsely remembered having taken the actions they had previously denied. Students who reported such memory errors were also more likely to change their attitudes toward gay men. Their analyses found a significant linear trend where more attitude change was observed in students who reported more memory errors.

In their instructions, McIntyre et al. (2004) incorporated factors which have previously been shown to lead to increased memory errors (see Johnson et al. 1993; Ross & Homberge, 1990; Undeutsch, 1988). Students were encouraged to write detailed, first person accounts of the interactions. Research on source monitoring has found that increased detail included in imagining events increases the likelihood that source monitoring errors may arise in recalling the event (e.g. Johnson, 1988; Johnson et al., 1988; Johnson et al. 1993; Ross & Newby, 1996; Undeutsch, 1988).

Further research has found evidence that the amount of detail does relate to the number of memory errors recorded (Frye & Lord, 2007). Their manipulation took advantage of the predictions of Temporal Construal Theory (Liberman & Trope, 1998; Trope &

Liberman, 2003) and Action Identification Theory (Vallacher & Wegner, 1985; Wegner & Vallacher, 1986) that mental simulations tend to be more specific if they are temporally near, rather than distant. By having students write temporally near and distant scenarios, Frye and Lord showed that when the level of detail in students' scenarios was experimentally manipulated, students who included more specific detail also reported more memory errors and increased attitude change.

Both McIntyre et al. (2004) and Frye and Lord (2007) posited a memory mechanism for their results. They suggested that the attitude change that was observed was a result of source monitoring errors created by writing first person accounts of the interactions. Another possible explanation is that the attitude change occurred online at the time when students were writing the hypothetical scenarios. If this account is accurate, the memory errors observed were not errors at all, but merely a byproduct of the formation of new attitudes. Here, the changed attitudes created a bias in memory that led to a higher likelihood of reporting actions similar to those in the hypothetical scenarios. The current research sought to produce evidence that *memory errors* were responsible for the observed attitude change rather than attitude change creating *memory biases*.

THE CURRENT RESEARCH

Two studies test the prediction that writing hypothetical scenarios involving previously denied actions can produce source monitoring errors and that those errors lead to attitude change. The first study replicates previous findings that both memory errors and attitude change are observed following a manipulation wherein students write hypothetical scenarios. In the study, students reported their attitudes immediately after the manipulation. If the memory bias explanation is correct, the majority of the observed attitude change should

be observed at this time and should not increase in the time between the manipulation and the final attitude report. If the memory errors account is correct, attitude change should not be observed until the final attitude report after the source confusion between real and hypothetical events has occurred.

A second study compares the scenario-writing manipulation with another manipulation designed to affect attitude change in the same amount and direction. Some students here were asked to read a persuasive message intended to produce attitude change. If the memory errors mechanism is accurate, memory errors should not be observed for students who read the persuasive message, even though their attitude change should be approximately equivalent to those students who wrote the hypothetical scenarios. The number of memory errors recorded for students who read the persuasive message would also not be expected to correlate with the amount of attitude change observed.

Study 1

Study 1 tested whether attitude change is occurring online, while students are writing hypothetical scenarios of interactions, or if attitude change occurs some time after the manipulation. If the memory errors previously observed are a result of a memory bias created by changed attitudes, attitude change would be expected to have occurred at the time participants were writing about imagined interactions. If, however, attitude change is a result of memory errors, attitude change would not be expected until some time after the manipulation. Attitude change would occur during the period when source confusions were occurring.

Method

Participants

Thirty-two undergraduate students participated in the current study for course credit. One student did not complete all three experimental sessions and was dropped from analysis leaving thirty-one participants (25 women and 6 men).

Procedure

Following procedures from previous studies (i.e. Frye & Lord, 2007; McIntyre, Lord, Lewis, & Frye, 2004) students participated in three experimental sessions. The first session had students complete several questionnaires including attitude ratings toward several social groups and issues (Appendix A) and reports of attitude-relevant actions (Appendix B). Attitudes were reported on 11-point Likert-type scales from -5 (*Highly Unfavorable*) through 0 (*Neutral*) to +5 (*Highly Favorable*). Students were also asked to report on their past interactions with members of various social groups including the target group, gay men. Students were given a list of 67 actions (e.g. talk to, get to know, avoid talking to, try to meet, argue with, etc.) and asked to mark any action that they had ever taken with a member of each group. Students were reminded with oral and written instructions to review the list carefully to ensure that they had circled all of the applicable actions.

Three weeks later, students returned to participate in a second, “unrelated” study. A second experimenter told the students that she was conducting a series of studies regarding the creative processes of writers. The experimenter explained that writers for movies, television shows, and plays have the ability to write fictional scenes that are incredibly vivid and realistic. The students were instructed to write four hypothetical “scenes” that would revolve around themselves as one of the central characters (Appendix C). Each student was

given four different scenes to write that included themselves interacting positively with a gay man. The events students wrote about were chosen based on the actions reported during the first session. Three of the scenes included positive actions that the student had previously reported having never taken toward a gay man. Another action that the student had reported having taken in the past was also included as the topic of a fourth scene. Students were asked to include as much detail as possible in their scenes and to include the thoughts and feelings of the characters as well as the events they were describing. Approximately one hour was allotted for students to write the four scenes and they were encouraged to continue writing for the entire time adding additional detail whenever possible. Just before the completion of the session, students were asked to complete a short series of questionnaires that included an attitude-rating scale. On the scale, they reported their attitudes toward gay men immediately after the scenario-writing manipulation.

After another three weeks, students returned for the final experimental session. Again, they were greeted by another experimenter and told that this was a new study that was unrelated to the previous two. Students were presented with a packet of questionnaires that included reformatted versions of attitude scales (Appendix D) and the action lists (Appendix E) completed in the first session. Once all students had completed the packets they were thoroughly debriefed and questioned about the hypotheses of the studies in which they had participated. No students correctly guessed the hypothesis or voiced suspicion regarding the relatedness of the three sessions.

Results and Discussion

The alternate explanation of the McIntyre et al. (2004) and Frye and Lord (2007) results claims that attitude change occurred when participants were writing their imaginary

scenarios, and that the resulting attitude change created a memory bias where errors were observed. The more participants changed their attitudes online, the greater the number of subsequent memory errors they made that were consistent with their altered attitudes. If the alternate explanation is accurate, greater attitude change would be expected immediately after students wrote their hypothetical scenarios than three weeks after the imaginary scenarios were written.

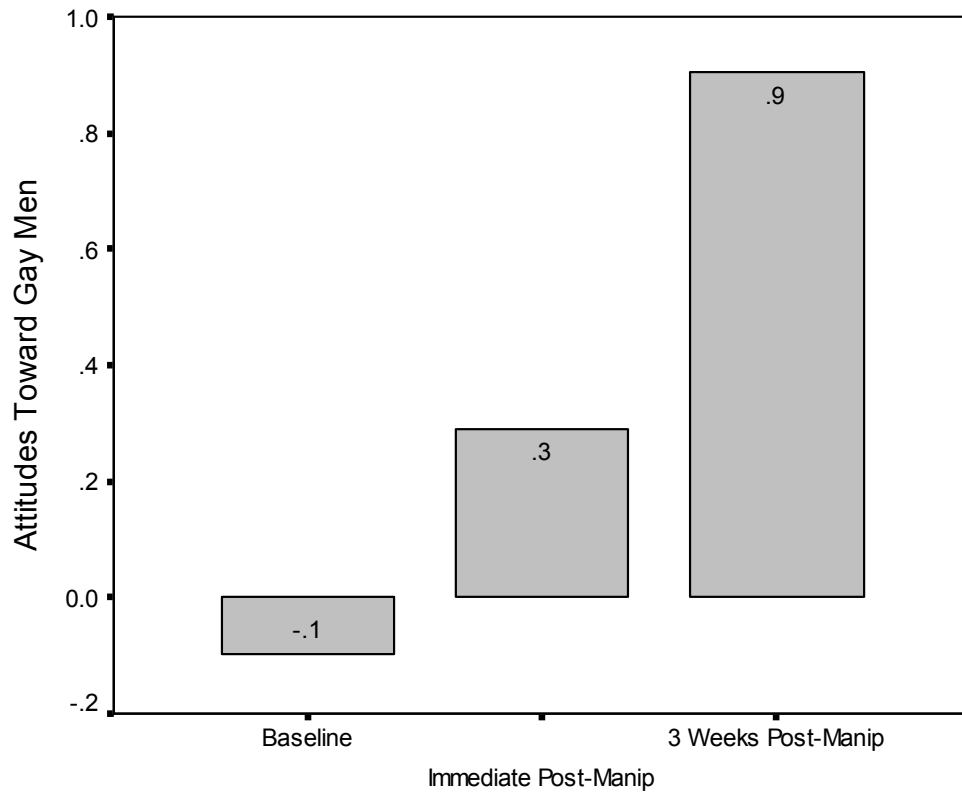
In contrast, a source monitoring, or memory errors, explanation of the results claims that maximal attitude change did not occur until enough time had elapsed for source monitoring errors to arise. The more students misremembered taking positive actions, the more they changed their reported attitudes to accord with those altered memories. If the memory errors explanation is accurate, we would expect greater attitude change three weeks after participants had written their imaginary scenarios than immediately after. We would also expect the number of memory errors to significantly predict the delayed attitude change.

Attitude Change

By repeated measures analysis of variance (ANOVA), there was a significant change in the three attitude reports; $F(2, 60) = 4.09, p = .022$. Figure 1 shows mean attitudes at each of the three reports. Consistent with our source monitoring explanation, post-hoc Dunnett's comparison tests showed that baseline attitude reports ($M = -.10, sd = 3.04$) did not significantly differ from attitude reports immediately after the manipulation ($M = .29, sd = 2.81$). Baseline attitudes did significantly differ from attitude reports three weeks after the manipulation ($M = .90, sd = 2.76$) by Dunnett's test ($p < .05$). If attitudes had changed online, we would have seen baseline attitudes change immediately following the manipulation.

Significant attitude change, however, was not observed until the third attitude report when enough time had elapsed for source monitoring errors to occur.

Figure 1: Mean attitudes at baseline, immediately after the manipulation, and three weeks following the manipulation (Study 1).



Memory Errors

To test if the manipulation was successful, the actions reported during the final session were examined. At time three, the average participant reported taking 36.6% of the

target actions. Of all other actions reported at time three, the probability that a participant would have circled any specific action during the third session that had not been previously reported was .09. By paired-samples *t*-tests, students did not report significantly more actions from Session 1 ($Mn = 17.48, sd = 9.61$) to Session 3 ($Mn = 18.03, sd = 8.71$); $t(30) = .632, ns$. As there was no difference between the number of actions reported at the first and last sessions and the difference between the probabilities of reporting new actions vs. the target actions, it seems unlikely that students were merely reporting more varied actions that happened to include the target actions.

Source monitoring errors were recorded when students reported taking an action in the third session that they wrote about during the second session and had previously denied ever having taken. Students, therefore, could have up to three source monitoring errors. Consistent with predictions, and shown in Figure 2, the number of source monitoring errors did not significantly predict attitude change from the baseline to immediately after the manipulation; $R^2 = .042, \beta = .206, t(30) = 1.134, ns$. If attitude change occurred online and later produced a memory bias, the amount of attitude change immediately after the manipulation would have been expected to predict the number of memory errors.

Figure 2: Attitude change, from baseline, immediately after the manipulation for students who reported 0, 1, 2, or 3 source monitoring errors (Study 1).

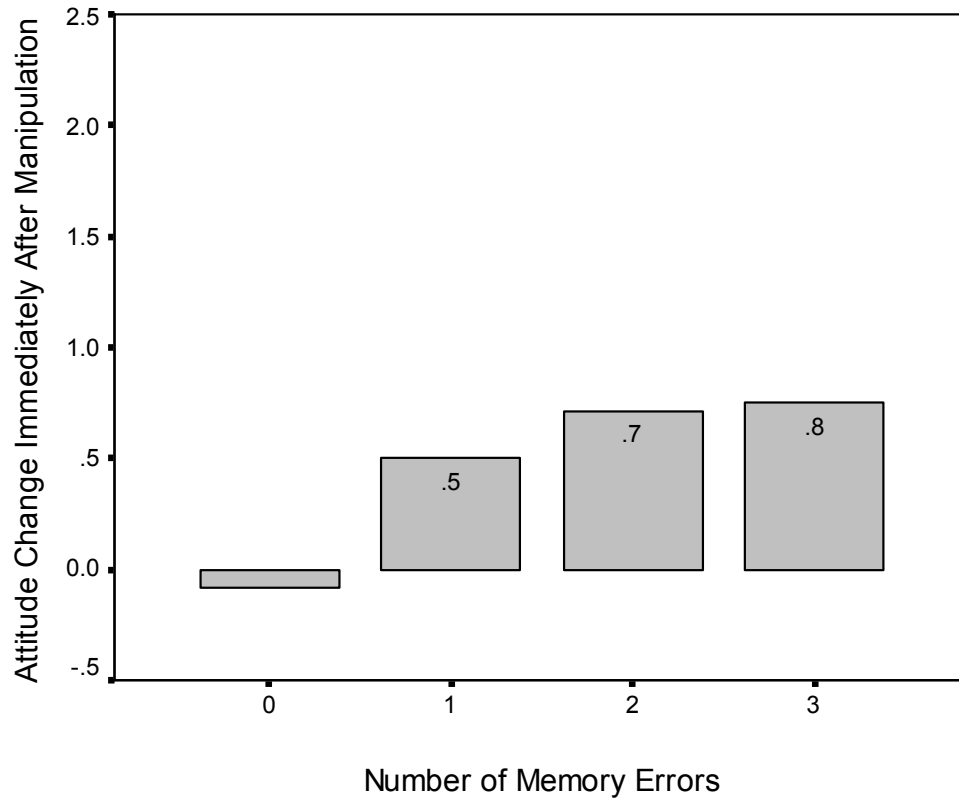
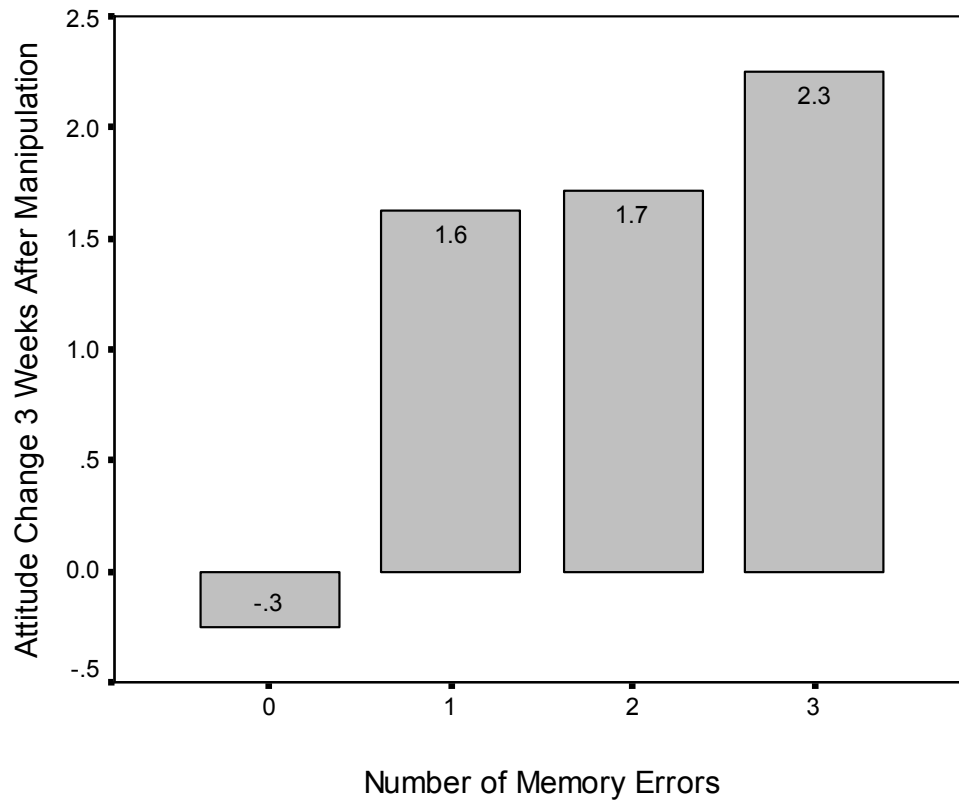


Figure 3 shows that, consistent with our prediction that the creation of source monitoring errors produces attitude change, the number of memory errors was found to significantly predict the overall attitude change from first to last session; $R^2 = .142$, $\beta = .377$, $t(30) = 2.196$, $p = .036$.

Figure 3: Attitude change, from baseline, three weeks after the manipulation for students who reported 0, 1, 2, or 3 source monitoring errors (Study 1).



Study 2

Study 1 supported the assertion that memory errors are responsible for attitude change. If memory errors were a result of biases created from altered attitudes, attitude change would have been observed immediately after the manipulation. Significant attitude change was not observed, however, until three weeks following the manipulation, and it was only the delayed attitude change that was correlated with memory errors. Study 2, again, tests

for evidence of a memory-based mechanism for attitude change. Here, the scene writing manipulation is compared with another attitude change manipulation. If attitude change creates a memory bias, both manipulations should create equal numbers of source monitoring errors. In contrast, if source monitoring errors are leading to attitude change, memory errors should be greater when the manipulation involves imagined actions toward the attitude object rather than a different but equally effective attitude change technique. Memory errors would only be expected to predict attitude change for participants who wrote about interactions with the attitude object.

Method

Participants

Seventy undergraduate students participated for course credit. Five students failed to complete all three of the experimental sessions and one student expressed suspicion regarding the unrelatedness of the three experimental sessions, leaving sixty-four students (53 women and 11 men) to include in analyses.

Procedure

The basic procedure for Study 2 was similar to that of the first study: having students participate in three “unrelated” experimental sessions in which they reported their attitudes and identified previous actions during both the first and last session. During the first session students reported their attitudes (Appendix A) toward several social groups and issues (including the target group, gay men) on 11-point Likert-type scales -5 (*Highly Unfavorable*) through 0 (*Neutral*) to +5 (*Highly Favorable*) and reported on their past interactions with members of various social groups. On the same list of 67 actions (e.g. talk to, get to know, avoid talking to, try to meet, argue with, etc.) used previously, students were asked to mark

any action that they had ever taken with a member of each group (Appendix B). Again, students were reminded with oral and written instructions to review the list carefully to ensure that they had circled all of the applicable actions.

In a second, unrelated, session three weeks later, students were divided into three groups. Approximately one third of the students completed the scene-writing manipulation in the same manner as previously described (Appendix C). These students wrote four hypothetical scenes that were to include themselves interacting positively with a gay man. The interactions students wrote about were chosen from the list of actions presented during the first session of the experiment. For each student, three positive actions that the student had reported having never taken and one action that the student reported having taken were chosen as the basis for three scenes. Here, again, students were encouraged to include as much detail as possible about their hypothetical interactions. Another third of the students was asked to read, and answer questions about, an article designed to change attitudes toward gay men (Appendix F). In a pretest the article was found to change attitudes toward gay men in a magnitude approximately equal to the amount of attitude change previously observed following the scene-writing manipulation. The article was a persuasive message that detailed arguments for the rights of gay and lesbian couples to adopt children. As a control, the final third of the students were asked to read, and answer questions about, an unrelated article that was not expected to impact attitudes in any way (Appendix G).

When students returned for the final experimental session, three weeks later, they completed a packet of questionnaires that included reformatted versions of the attitude rating scales (Appendix D) and the action reporting lists (Appendix E) that they had completed during the first experimental session. During a detailed debriefing of students at the end of

the first session, no students correctly guessed the experimental hypothesis. One student reported suspicion that the three studies were not unrelated and was removed from analyses.

Source monitoring errors were scored in the same way as in Study 1 for students in the scene-writing group. Here, a memory error was recorded when a student reported taking an action that he or she had previously denied after writing about an interaction that included that action. As students in the other groups did not write about previously denied actions, source monitoring errors were recorded through a process where each participant in those groups was yoked with a participant who wrote the hypothetical scenarios. Participants were yoked via a matching process that had students in the persuasive message and control groups matched with participants who wrote hypothetical scenarios who had as similar initial attitudes as possible. Then participants were matched on the actions they reported taking toward the target group during the first session. Students who were yoked together could, presumably, been given the same actions to write about during the manipulation had they been asked to write the hypothetical scenarios. For students in the persuasive message and control groups, memory errors were recorded when they reported taking one of the actions chosen for them during the matching procedure.

Results and Discussion

In Study 2, a second test of two competing explanations of attitude change was conducted. The memory error account of attitude change relating to memory errors is that the observed attitude change is a result of misremembered interactions with a member of the target group. Once a source monitoring error has occurred, placing an imagined event into the participant's memory, attitude change is observed as he or she looks back at previous behaviors in determining a current attitude. The competing explanation, that attitude change

is occurring online and leads to a later memory bias, would suggest different predictions for the current study's results. If a memory bias explanation is correct, any attitude change manipulation would be expected to produce similar responses when students reported actions during the final session and the actions they reported could not be predicted by the hypothetical scenarios previously written. Conversely, if a memory error account is accurate, the specific actions students report could only be predicted for those who had incorporated the imagined events into their own memories.

Attitude Change

One-way t tests were used to examine whether attitude change for each of the three groups was significantly greater than zero. Attitude change was found to be greater than zero both for students who wrote hypothetical scenarios ($t(24) = 3.83, p < .05$) and for students who read the persuasive message ($t(19) = 2.1, p < .05$); but did not significantly differ from zero for the control group ($t(18) = -.89, ns$).

The overall amount of attitude change for the three groups was found to significantly differ across the three groups by one-way ANOVA; $F(2, 63) = 4.335, p = .016$. Conforming to the expected patterns, students in the control group showed significantly less attitude change than students who wrote hypothetical scenarios or students who read the persuasive message. Attitude change did not differ between students who wrote scenarios and students who read the persuasive message. Table 1 shows the means and standard deviations of attitude change and memory errors for the three groups.

Table 1: Mean attitude change and source monitoring errors for three groups (Study 2).

	Scene-Writing <i>n</i> = 25	Persuasive Message <i>n</i> = 20	Control <i>n</i> = 19
Attitude Change	1.08 ^a (1.41)	.90 ^a (1.93)	-.21 ^b (1.03)
Memory Errors	1.56 ^c (.96)	.85 ^d (1.04)	.63 ^d (.83)
Correlation	.488*	-.166	-.225

Note: Standard deviations shown in parentheses. Means with different superscripts significantly differ by Tukey's test ($p < .05$). ** signifies a Pearson's r significant at $p < .05$.

Memory Errors

As a manipulation check, action reports from the final experimental session were examined. Table 2 shows that the manipulation was effective in causing students to report a greater percentage of the target actions than novel actions during the final session. As with Study 1, there was no significant difference in the number of actions reported between the first and last sessions for any of the three groups see Table 3). Given that there was no difference between the number of actions reported at the first and last sessions for any group, and that the difference between the probabilities of reporting new actions vs. the target actions, it seems unlikely that students were merely reporting more varied actions that happened to include the target actions.

Table 2: Percentage of target and new actions reported during final experimental session (Study 2).

	Scene-Writing <i>n</i> = 25	Persuasive Message <i>N</i> = 20	Control <i>n</i> = 19
Target Actions	52%	28.3%	21%
New Actions	8.9%	7.7%	9.6%

Table 3: Mean number of actions reported during the first and last sessions for each group. (Study 2).

	Scene-Writing <i>n</i> = 25	Persuasive Message <i>N</i> = 20	Control <i>n</i> = 19
Session 1	19.92 (7.44)	20.75 (9.84)	18.26 (9.64)
Session 3	19.12 (7.91)	20.15 (10.23)	20.26 (8.72)
Paired-samples <i>t</i> -test	.772	.366	.973

Note: Standard deviations shown in parentheses. No *t*-tests were significant at $p < .05$.

Regression analyses supported the findings showing that the number of memory errors significantly predicted attitude change for students who wrote about positive interactions with a gay man; $R^2 = .238$, $\beta = .488$, $t(24) = 2.68$, $p = .013$. Figure 4 shows attitude change for students who did and did not report any memory errors. As seen in Figure 5, attitude change was not significantly related to the number of memory errors for students who read the persuasive message; $R^2 = .028$, $\beta = .166$, $t(19) = .716$, *ns*. Figure 6 shows that, for students in the control group, source monitoring errors did not significantly predict attitude change; $R^2 = .051$, $\beta = .225$, $t(18) = .963$, *ns*. Attitude change was only predicted by memory errors for students who wrote about imagined interactions with members of the target group suggesting that the source monitoring account for attitude change is accurate. Comparing Figures 4 – 6, attitude change was only predicted by memory errors in the scene-writing group. If observed memory errors were a result of a memory bias related to the attitude change manipulation, the errors would have been expected to have been observed following the persuasive message manipulation also.

Figure 4: Attitude change for students who reported 0, 1, 2, or 3 source monitoring errors in the scene writing group (Study 2).

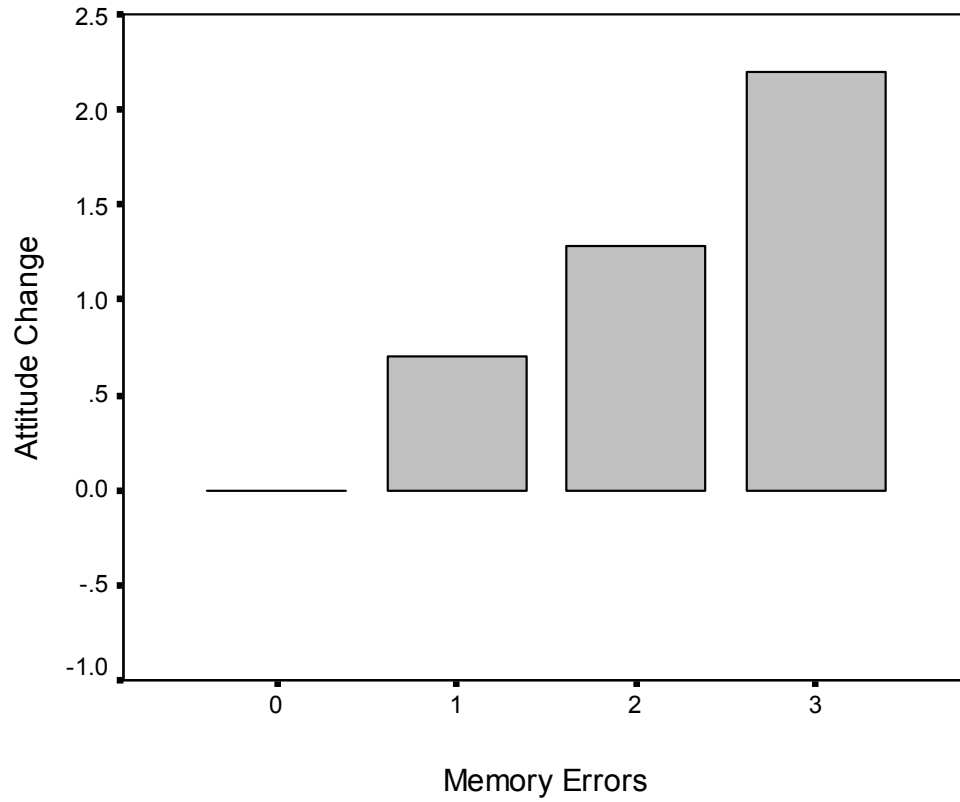


Figure 5: Attitude change for students who reported 0, 1, 2, or 3 source monitoring errors in the persuasive message group (Study 2).

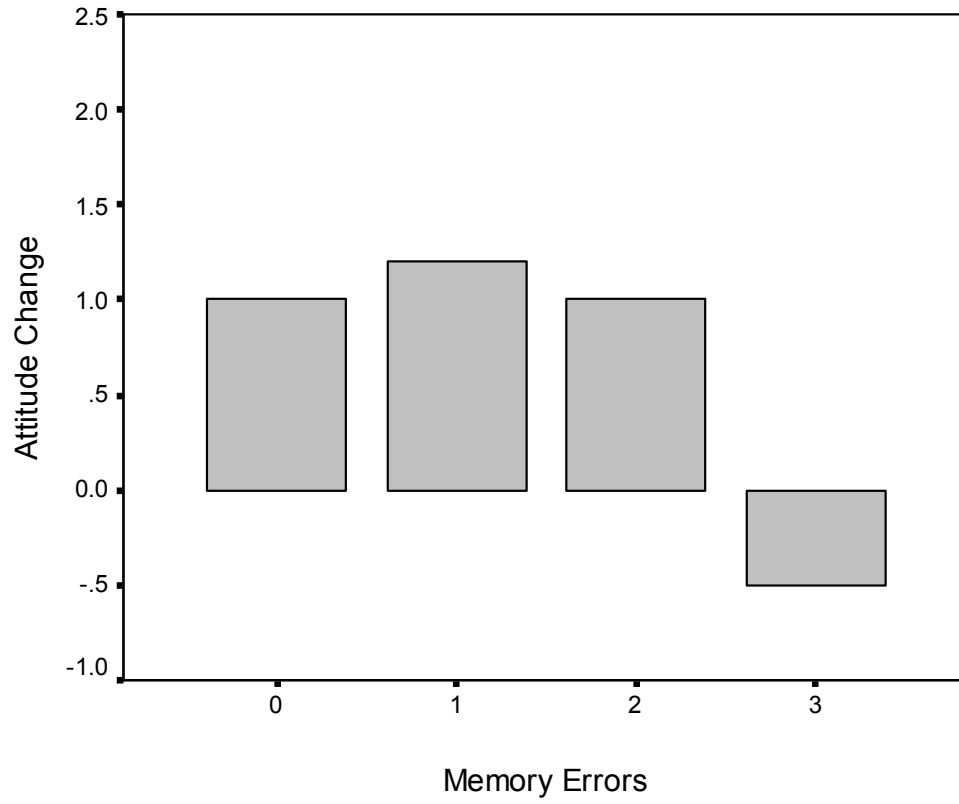
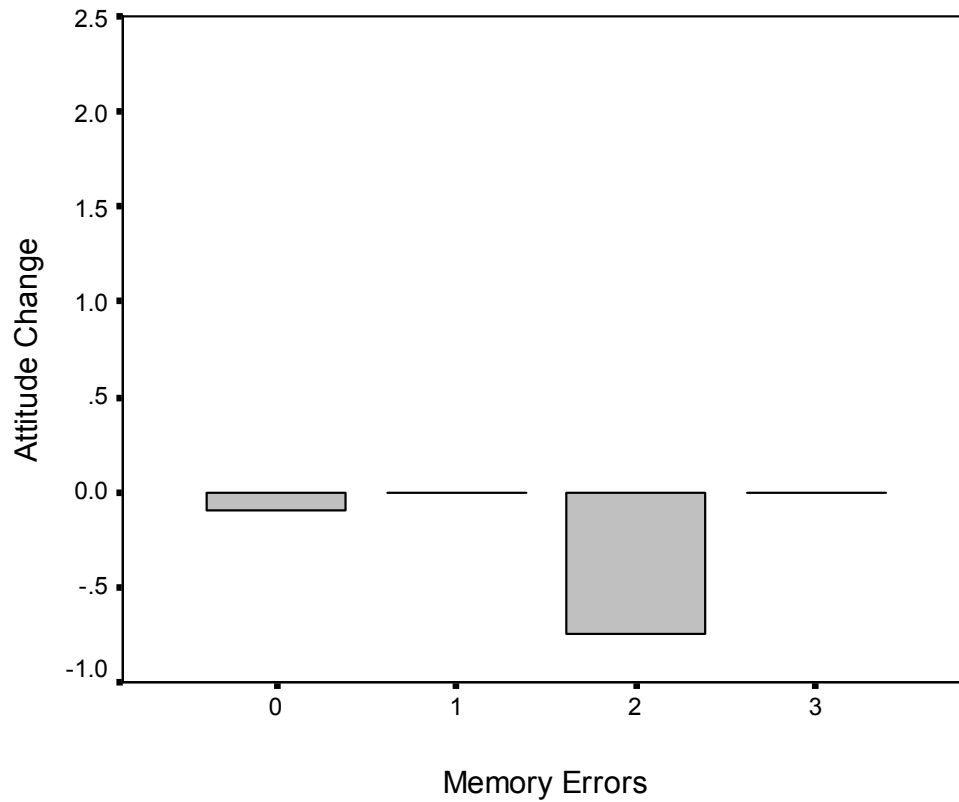


Figure 6: Attitude change for students who reported 0, 1, or 2 source monitoring errors in the control group (Study 2).



Note: No students reported more than two memory errors.

GENERAL DISCUSSION

The current studies supported the memory error explanation previously proposed for the attitude change results found following imagined hypothetical attitude-relevant interactions (Frye & Lord, 2007; McIntyre, Lord, Lewis, & Frye, 2004). In Study 1 attitude change was not observed immediately after students wrote hypothetical scenarios about

imagined interactions with a gay man. Attitude change was, however, observed three weeks after the manipulation. Study 2 found that a different attitude change manipulation led to approximately the same amount of attitude change as writing hypothetical scenarios, but did not produce memory errors. Had the alternate hypothesis that attitude change was creating a memory bias been correct, memory errors would have been expected to occur after any attitude change manipulation. Errors were not, however, recorded for students who read a persuasive message, suggesting that the attitude change in Study 2 was the result of source monitoring errors.

Research on the creation of attitude change following persuasive messages has revealed similar results as to those of Study 1. The *sleeper effect* described by Hovland's Yale group showed that, under certain circumstances, persuasive messages may have a delayed impact on attitudes (e.g. Hovland, Janis, & Kelley, 1953; Hovland, Lumsdaine, & Sheffield, 1949). In such experiments, attitude change was not observed immediately after participants were presented with a persuasive message, but attitudes did change in the following weeks. Memory associations that bound the persuasive message to some discounting cue were believed to degrade over time, leaving the message intact in memory. We believe that a similar mechanism accounts for the current results. Johnson and her colleagues (e.g. Johnson, Hashtroudi, & Lindsay, 1993; Lindsay & Johnson, 1989) suggest that source monitoring errors occur for the same reasons. That is, there can be associations within the memory for an event that tie it to either reality or imagination. Over time, source confusions can occur that may disrupt those associations; and as those confusions proliferate throughout the memory for a given event, errors are likely to occur.

Other factors that are believed to influence both attitude change and the formation of memory errors are elaboration and repetition. Petty and Cacioppo (1986a; 1986b) suggest that increased thinking about a persuasive message typically leads to increased attitude change. Janis' classic role-playing studies also showed that elaborating on a persuasive message and thinking about the argument, through biased scanning, leads to increased attitude change (Janis, 1959; Janis & Gilmore, 1965; Janis & King, 1954). Janis and his colleagues found that participants who added their own details to an argument were more likely to report changed attitudes. In the source monitoring literature, participants who added their own details to the descriptions of an event over time were more likely to falsely remember the event as having actually occurred (e.g. Hyman, Husband, & Billings, 1995; Loftus, 1993). Downing, Judd, and Brauer (1992) showed that attitude change followed repeated expressions of the attitude, and Brainerd, Reyna, and their colleagues (e.g. Brainerd & Reyna, 1996; Brainerd, Reyna, & Kneer, 1995; Brainerd, Reyna, & Mojardin, 1999) showed that repeated presentations of stimuli led to increased memory errors when participants were later asked to recognize or recall the stimuli. In the current research, students not only imagined, but wrote scenarios about hypothetical interactions with the target. These scenarios required message-related thinking in such ways as would typically be seen to increase both memory errors and attitude change.

Allport's (1954) Contact Hypothesis suggests that interactions with a member of a disliked out-group may decrease stereotyping and prejudice toward that group. Research has shown that there are several caveats to the contact hypothesis. For instance, there often must be numerous interactions before attitudes change (Brewer, Dull, & Lui, 1981; Queller & Smith, 2002). When individuals encounter a member of a disliked outgroup, they will

sometimes subtype that single group member as an “exception to the rule.” When, however, multiple interactions with multiple outgroup members have taken place, it becomes more difficult to discount all of the encountered outgroup members as exceptions. One drawback of the implementation of the contact hypothesis in reducing stereotyping and prejudice is the difficulty of establishing interactions between members of different groups, and then to produce numerous interactions between and larger number of group members. The current work suggests that the face-to-face interactions typically thought of in relation to the contact hypothesis may not be necessary. Other attitude change research has shown that imagining interactions with a member of a stigmatized group can alter implicit attitudes (Blair, Ma, & Lenton, 2001). There was no measure of memory errors for the imagined interactions, but it seems possible that individuals who were most likely to misremember the imagined events as real would have shown the most change in implicit attitudes.

We have seen that imagining interactions with a member of a stigmatized group can improve attitudes toward that group when the imagined interactions are recalled as actual events. It seems possible that many of the difficulties associated with the contact hypothesis can be overcome by implementing the scene-writing manipulation. After imagining multiple detailed interactions with numerous outgroup members, those interactions may be recalled as real and reduce stereotyping and prejudice toward that group.

Another practical implication of the current work may be in clinical settings. Systematic desensitization (Moss & Arend, 1977; Wolpe, 1958, 1974) has long been used to assist people with overcoming phobias. Systematic desensitization begins with having an individual attempt to remain calm while imagining the target of their phobia. Slowly, the imagined interactions build up to an actual encounter with the phobia’s target. The current

research suggests that the imagined encounters with the target of the phobia that are remembered as actual events may be the most influential in changing attitudes regarding one's phobia.

Numerous research studies have shown the people can be made to report remembering events that never occurred (see Brainerd & Reyna, 2005 for a detailed review). While there is no way to be entirely certain that students never took the actions that they later reported, we are confident that there are memory errors of some sort. It is possible that the manipulation simply reminded students of some previous event that they failed to report in the initial questionnaire or that they redefined previous events in such a way that they fit into different categories at the time of the final report. Even though the current research cannot eliminate these possibilities, previous research has shown that people can be made to remember events by simply imagining them (Garry, Manning, Loftus, & Sherman, 1996; Goff & Roediger, 1996). Goff and Roediger (1996), for example, reported source monitoring errors after participants imagined themselves performing unlikely actions.

The current research supported our contention that there is a memory error mechanism underlying the attitude change results previously observed following writing hypothetical scenarios of attitude-relevant interactions (Frye & Lord, 2007; McIntyre, Lord, Lewis, & Frye, 2004). Although there is no way to be certain that the source monitoring errors reported are entirely new memories, the lack of errors reported by participants who completed another attitude change manipulation suggests that memory errors are responsible for the attitude change found using the scene-writing paradigm. The lack of significant attitude change immediately following the manipulation also shows that attitude change is not occurring online while participants are writing about their imagined interactions, which

suggests that the time needed for source monitoring confusions to occur parallels the time necessary for attitude change to occur. It takes time for the memory of past attitude-relevant actions to become more persuasive than the experience of present ones.

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Appendix A

Please answer the following questions by filling in the bubble that best represents your attitude:

What is your attitude toward <i>professional athletes</i> ?										
⑤	④	③	②	①	①	②	③	④	⑤	
Very Unfavorable					Neutral				Very Favorable	

What is your attitude toward <i>politicians</i> ?										
⑤	④	③	②	①	①	②	③	④	⑤	
Very Unfavorable					Neutral				Very Favorable	

What is your attitude toward <i>gay men</i> ?										
⑤	④	③	②	①	①	②	③	④	⑤	
Very Unfavorable					Neutral				Very Favorable	

What is your attitude toward <i>lesbians</i> ?										
⑤	④	③	②	①	①	②	③	④	⑤	
Very Unfavorable					Neutral				Very Favorable	

What is your attitude toward <i>lawyers</i> ?										
⑤	④	③	②	①	①	②	③	④	⑤	
Very Unfavorable					Neutral				Very Favorable	

What is your attitude toward <i>professors</i> ?										
⑤	④	③	②	①	①	②	③	④	⑤	
Very Unfavorable					Neutral				Very Favorable	

1

Please answer the following questions by filling in the bubble that best represents your attitude:

What is your attitude toward *talk show hosts*?

(-5) (-4) (-3) (-2) (-1) (0) (1) (2) (3) (4) (5)

Very Unfavorable Neutral Very Favorable

What is your attitude toward *newscasters*?

(-5) (-4) (-3) (-2) (-1) (0) (1) (2) (3) (4) (5)

Very Unfavorable Neutral Very Favorable

What is your attitude toward *welfare recipients*?

(-5) (-4) (-3) (-2) (-1) (0) (1) (2) (3) (4) (5)

Very Unfavorable Neutral Very Favorable

What is your attitude toward *former mental patients*?

(-5) (-4) (-3) (-2) (-1) (0) (1) (2) (3) (4) (5)

Very Unfavorable Neutral Very Favorable

What is your attitude toward *environmental activists*?

(-5) (-4) (-3) (-2) (-1) (0) (1) (2) (3) (4) (5)

Very Unfavorable Neutral Very Favorable

What is your attitude toward *PETA (People for the Ethical Treatment of Animals)*?

(-5) (-4) (-3) (-2) (-1) (0) (1) (2) (3) (4) (5)

Very Unfavorable Neutral Very Favorable

Please answer the following questions by filling in the bubble that best represents your attitude:

What is your attitude toward *capitol punishment*?

(-5) (-4) (-3) (-2) (-1) (0) (1) (2) (3) (4) (5)
Very Unfavorable Neutral Very Favorable

What is your attitude toward *abortion*?

(-5) (-4) (-3) (-2) (-1) (0) (1) (2) (3) (4) (5)
Very Unfavorable Neutral Very Favorable

What is your attitude toward *stem cell research*?

(-5) (-4) (-3) (-2) (-1) (0) (1) (2) (3) (4) (5)
Very Unfavorable Neutral Very Favorable

What is your attitude toward *sex education in public schools*?

(-5) (-4) (-3) (-2) (-1) (0) (1) (2) (3) (4) (5)
Very Unfavorable Neutral Very Favorable

What is your attitude toward *year-round schooling*?

(-5) (-4) (-3) (-2) (-1) (0) (1) (2) (3) (4) (5)
Very Unfavorable Neutral Very Favorable

What is your attitude toward *standardized testing*?

(-5) (-4) (-3) (-2) (-1) (0) (1) (2) (3) (4) (5)
Very Unfavorable Neutral Very Favorable

Appendix B

Please fill in the circle beside each action that you have ever take toward
a *gay man* or *gay men*

<input type="radio"/> abuse
<input type="radio"/> argue with
<input type="radio"/> attack physically
<input type="radio"/> attend meetings for
<input type="radio"/> avoid being seen with
<input type="radio"/> avoid helping
<input type="radio"/> avoid talking to
<input type="radio"/> be cautious around
<input type="radio"/> be cheerful toward
<input type="radio"/> be courteous to
<input type="radio"/> be friends with
<input type="radio"/> be helpful to
<input type="radio"/> be impolite to
<input type="radio"/> be kind to
<input type="radio"/> boycott
<input type="radio"/> cause trouble for
<input type="radio"/> confide in
<input type="radio"/> criticize
<input type="radio"/> date
<input type="radio"/> defend
<input type="radio"/> discriminate against
<input type="radio"/> donate money to, etc.
<input type="radio"/> donate time to help
<input type="radio"/> eat or drink with
<input type="radio"/> educate others about
<input type="radio"/> express understanding
<input type="radio"/> fight with
<input type="radio"/> get to know
<input type="radio"/> give special treatment
<input type="radio"/> go in public with
<input type="radio"/> harass
<input type="radio"/> hug
<input type="radio"/> hurt emotionally
<input type="radio"/> ignore
<input type="radio"/> imitate
<input type="radio"/> introduce to friends/family

<input type="radio"/> learn about
<input type="radio"/> learn from
<input type="radio"/> look away from
<input type="radio"/> make eye contact
<input type="radio"/> make feel comfortable
<input type="radio"/> move away from
<input type="radio"/> not imitate
<input type="radio"/> ostracize
<input type="radio"/> praise
<input type="radio"/> promote cause
<input type="radio"/> put down ideas
<input type="radio"/> raise money for
<input type="radio"/> show sympathy toward
<input type="radio"/> refuse to support
<input type="radio"/> spend time with
<input type="radio"/> stay away from
<input type="radio"/> take political action against
<input type="radio"/> take political action for
<input type="radio"/> talk against
<input type="radio"/> talk to
<input type="radio"/> threaten
<input type="radio"/> touch
<input type="radio"/> treat differently
<input type="radio"/> treat the same as others
<input type="radio"/> treat with respect
<input type="radio"/> try to exclude
<input type="radio"/> try to meet
<input type="radio"/> tune out
<input type="radio"/> voice agreement with
<input type="radio"/> work for
<input type="radio"/> work with

Once you have finished, go back over the list until you are sure that you haven't left out even one action that you have taken toward a *gay man* or *gay men* at any time in the past.

Appendix C

We are studying the art of script writing. Scriptwriters describe scenes for movies, television shows, and plays. They can write about an imaginary scene as though it really happened. They can make the reader experience exactly what it was like to be a character in the scene. We want you to write a few scripts in which you describe fictitious events as though they really happened.

The first thing to do when writing a great scene is to define your characters. The characters in the scenes you write are **you** and the person mentioned in the scene description. You are free to include more characters, but make sure that you and the person whom the scene is about are the central characters.

Be sure to describe all of the thoughts and feelings that you were having while the events were occurring. Give the reader a window into what the characters were thinking and feeling.

Be sure to include as many details as possible, as in “I did this, then I felt this, then the other person said this and I thought that, then I said this . . .”

Use your imagination. Make the event seem as real and vivid as possible. Tell the reader what the circumstances were that led up to the event, where you were, what you heard, saw, and especially what you thought and felt. Describe in detail what other people said or did, and so on. Do the best you can to produce a compelling, *believable* first-person account that emphasizes what you thought and felt in each scene.

Now, move on to the following pages and write a short scene based on what is described at the top of each page.

Appendix D

Instructions:

Please answer the following questions using the scale below:

-5	-4	-3	-2	-1	0	1	2	3	4	5
Extremely Unfavorable					Neutral					Extremely Favorable

What is your attitude toward *abortion*? _____

What is your attitude toward *professors*? _____

What is your attitude toward *politicians*? _____

What is your attitude toward *gay men*? _____

What is your attitude toward *former mental patients*? _____

What is your attitude toward *lesbians*? _____

What is your attitude toward *journalists*? _____

What is your attitude toward *exercising*? _____

What is your attitude toward *lawyers*? _____

What is your attitude toward *newscasters*? _____

What is your attitude toward *professional athletes*? _____

What is your attitude toward *studying*? _____

What is your attitude toward *capital punishment*? _____

What is your attitude toward *affirmative action*? _____

What is your attitude toward *underage drinking*? _____

Appendix E



Please circle each action that you have ever take toward any *Gay Man*

- | | |
|-----------------------------|-------------------------------|
| abuse | learn about |
| argue with | learn from |
| attack physically | look away from |
| attend meetings for | make eye contact |
| avoid being seen with | make feel comfortable |
| avoid helping | move away from |
| avoid talking to | not imitate |
| be cautious around | ostracize |
| be cheerful toward | praise |
| be courteous to | promote cause |
| be friends with | put down ideas |
| be helpful to | raise money for |
| be impolite to | show sympathy toward |
| be kind to | refuse to support |
| boycott | spend time with |
| cause trouble for | stay away from |
| confide in | take political action against |
| criticize | take political action for |
| date | talk against |
| defend | talk to |
| discriminate against | threaten |
| donate money to, etc. | touch |
| donate time to help | treat differently |
| eat or drink with | treat the same as others |
| educate others about | treat with respect |
| express understanding | try to exclude |
| fight with | try to meet |
| get to know | tune out |
| give special treatment | voice agreement with |
| go in public with | work for |
| harass | work with |
| hug | |
| hurt emotionally | |
| ignore | |
| imitate | |
| introduce to friends/family | |

Once you have finished, go back over the list until you are sure that you haven't left out even one action that you have taken toward any *Gay Man*

Appendix F

The *American Psychological Association* constantly reviews research relating to current social issues. As a matter of public interest, they report their findings in *Policy Statements* designed to address these various topics. The following *Statement* concerns criticisms of gay and lesbian couples adopting children. Please read the *APA's Statement* carefully, we would like you to answer a few questions afterward regarding the issues addressed.

What happens if children in gay and lesbian couple households can't be adopted (or the parents aren't granted legal custody)?

- By banning gay adoption, children in gay couple households have no legal status should something happen to the parents, including death or serious illness.
- Neither the parent nor child has visitation rights if the parents separate.
- The child cannot claim inheritances or other household assets in case of death.
- Gay couple parents without adoption rights do not benefit from the generous tax deductions granted to heterosexual parents.
- A parent without legal right to a child cannot legally register him/her for school.
- Parents cannot put children on some health insurance plans.
- Parents cannot make medical decisions for the child.
- The child has no claim to the social security or insurance benefits of the parent.
- If one parent dies, the second parent has no legal right to take custody or care for the child.

Many lesbians and gay men are parents. In the 2000 U. S. Census, 33% of female same-sex couple households and 22% of male same-sex couple households reported at least one child under the age of 18 living in the home. Despite the significant presence of at least 163,879 households headed by lesbian or gay parents in U.S. society, three major concerns about lesbian and gay parents are commonly voiced (Falk, 1994; Patterson, Fulcher & Wainright, 2002). These include concerns that lesbians and gay men are mentally ill, that lesbians are less maternal than heterosexual women, and that lesbians' and gay men's relationships with their sexual partners leave little time for their relationships with their children. In general, research has failed to provide a basis for any of these concerns (Patterson, 2000, 2004a; Perrin, 2002; Tasker, 1999; Tasker & Golombok, 1997). First, homosexuality is not a psychological disorder (Conger, 1975). Although exposure to prejudice and discrimination based on sexual orientation may cause acute distress (Mays & Cochran, 2001; Meyer, 2003), there is no reliable evidence that homosexual

orientation per se impairs psychological functioning. Second, beliefs that lesbian and gay adults are not fit parents have no empirical foundation (Patterson, 2000, 2004a; Perrin, 2002). Lesbian and heterosexual women have not been found to differ markedly in their approaches to child rearing (Patterson, 2000; Tasker, 1999). Members of gay and lesbian couples with children have been found to divide the work involved in childcare evenly, and to be satisfied with their relationships with their partners (Patterson, 2000, 2004a). The results of some studies suggest that lesbian mothers' and gay fathers' parenting skills may be superior to those of matched heterosexual parents. There is no scientific basis for concluding that lesbian mothers or gay fathers are unfit parents on the basis of their sexual orientation (Armesto, 2002; Patterson, 2000; Tasker & Golombok, 1997). On the contrary, results of research suggest that lesbian and gay parents are as likely as heterosexual parents to provide supportive and healthy environments for their children.

As the social visibility and legal status of lesbian and gay parents has increased, three major concerns about the influence of lesbian and gay parents on children have been often voiced (Falk, 1994; Patterson, Fulcher & Wainright, 2002). One is that the children of lesbian and gay parents will experience more difficulties in the area of sexual identity than children of heterosexual parents. For instance, one such concern is that children brought up by lesbian mothers or gay fathers will show disturbances in gender identity and/or in gender role behavior. A second category of concerns involves aspects of children's personal development other than sexual identity. For example, some observers have expressed fears that children in the custody of gay or lesbian parents would be more vulnerable to mental breakdown, would exhibit more adjustment difficulties and behavior problems, or would be less psychologically healthy than other children. A third category of concerns is that children of lesbian and gay parents will experience difficulty in social relationships. For example, some observers have expressed concern that children living with lesbian mothers or gay fathers will be stigmatized, teased, or otherwise victimized by peers. Another common fear is that children living with gay or lesbian parents will be more likely to be sexually abused by the parent or by the parent's friends or acquaintances.

Results of social science research have failed to confirm any of these concerns about children of lesbian and gay parents (Patterson, 2000, 2004a; Perrin, 2002; Tasker, 1999). Research suggests that sexual identities (including gender identity, gender-role behavior, and sexual orientation) develop in much the same ways among children of lesbian mothers as they do among children of heterosexual parents (Patterson, 2004a). Studies of other aspects of personal development (including personality, self-concept, and conduct) similarly reveal few differences between children of lesbian mothers and children of heterosexual parents (Perrin, 2002; Stacey & Biblarz, 2001; Tasker, 1999). However, few data regarding these concerns are available for children of gay fathers (Patterson, 2004b). Evidence also suggests that children of lesbian and gay parents have normal social relationships with peers and adults (Patterson, 2000, 2004a; Perrin, 2002; Stacey & Biblarz, 2001;

Tasker, 1999; Tasker & Golombok, 1997). The picture that emerges from research is one of general engagement in social life with peers, parents, family members, and friends. Fears about children of lesbian or gay parents being sexually abused by adults, ostracized by peers, or isolated in single-sex lesbian or gay communities have received no scientific support. Overall, results of research suggest that the development, adjustment, and well-being of children with lesbian and gay parents do not differ from that of children with heterosexual parents.

Appendix G

Semantic Interoperability is the ability of two or more computer systems to exchange information and have the meaning of that information accurately and automatically interpreted by the receiving system.

Interoperability is sometimes considered as an all-or-nothing attribute of computer systems, but for complex information, different levels of interoperability can be envisioned; when multiple pieces of information are being transferred, correct interpretation of some fraction of that information may be considered as constituting some level of semantic interoperability. Perfect semantic interoperability would require the correct interpretation of all transferred information.

The goal of efforts at empowering computer systems with semantic interoperability rests on the desirability of computer systems being able to find information and to use it for purposes that the original creator of the information did not anticipate. This goal of flexible information reuse requires some degree of understanding of the information, which in turn requires that the information be encoded in some standard fashion that is interpreted identically by all systems using that information.

To achieve the level of understanding usually implied by the term *semantic interoperability* requires the use of a knowledge representation language that is sufficiently expressive to describe all the nuances of meaning that are significant to the task at hand. This level of expressiveness will require an ontology with at least the full power of first-order logic for many tasks, though for some restricted tasks a description logic (such as the one used in the OWL semantic web ontology language), having an expressiveness somewhat less than first order, will be adequate. Human languages are highly expressive, but are considered too ambiguous to allow the accurate interpretation desired, given the current level of human language technology. To achieve perfect semantic interoperability, all communicating systems must use term (or symbol) definitions that are identical or can be accurately interconverted. Thus a common ontology is the ideal situation for semantic interoperability. Where that is impossible, lesser degrees of semantic interoperability may be achieved by techniques that automatically map the definitions used by one system to those of another.

Semantic interoperability may be distinguished from other forms of interoperability by considering whether the information transferred has, in its communicated form, all of the meaning required for the receiving system to interpret it correctly, even when the algorithms used by the receiving system are unknown to the sending system. To make this concrete, consider transmission of a number between two systems. If that number is intended to be the sum of money owed by one company to another, it may be correctly interpreted if sent in response to a specific request, and received at the time and in the form expected. But this correct interpretation does not depend only on the number itself, which could represent almost any of millions of types of quantitative measure, rather it depends strictly on the circumstances of transmission. That is, the interpretation depends on both systems expecting that the algorithms in the other system use the number in exactly the same sense, and it

depends further on the entire envelope of transmissions that preceded the actual transmission of the bare number. By contrast, if the transmitting system does not know how the information will be used by other systems, it is necessary to have a shared agreement on how information with some specific meaning (out of many possible meanings) will appear in a communication. For a particular task, one solution is to standardize a form, such as a request for payment; that request would have to encode, in standardized fashion, all of the information needed to evaluate it, such as: the agent owing the money, the agent owed the money, the nature of the action giving rise to the debt, the agents, goods, services, and other participants in that action; the time of the action; the amount owed and currency in which the debt is reckoned; the time allowed for payment; the form of payment demanded; and other information. When two or more systems have agreed on how to interpret the information in such a request, they can achieve semantic interoperability *for that specific type of transaction*. But for semantic interoperability generally, it is necessary to provide standardized ways to describe the meanings of many more things than just commercial transactions, and the number of concepts whose representation needs to be agreed upon are at a minimum several thousands.

How to achieve semantic interoperability for more than a few restricted scenarios is currently a matter of research and discussion. Some form of agreed common ontology, at least one that is sufficiently high-level to provide the defining concepts for more specialized ontologies, is believed by some to be essential. But there is as yet no single ontology accepted and used by more than a small number of leading-edge research groups. Whether use of a single high-level ontology can be avoided by sophisticated mapping techniques among independently developed ontologies is under investigation.

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ABSTRACT

ATTITUDE CHANGE AND SOURCE MONITORING ERRORS FOLLOWING IMAGINED SCENARIOS OF ATTITUDE-RELEVANT INTERACTIONS

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Two studies tested competing hypotheses explaining an attitude change phenomenon.

Previous studies have shown a relationship between memory errors and attitudes, where attitude change has been found to follow source monitoring errors of imagined events. It is believed that writing hypothetical scenarios of detailed, first person accounts of interactions with a target group member, causes source monitoring errors to occur where the imagined events become confused with actual events in memory. People often look to their memories for information when reporting their current attitudes, and errors in attitude-relevant memories are suspected to lead to altered attitude reports. A competing hypothesis may be that attitudes change online while imagining interactions with a target group member and that the observed memory errors are a byproduct of changed attitudes. Study 1 showed that attitudes did not significantly change immediately after writing hypothetical scenarios of imagined interactions, but did change three weeks following the manipulation when memory errors were found to have occurred. Study 2 showed that memory errors were not found

following a different attitude change manipulation that resulted in a similar magnitude of change. Here, again, attitude change did follow source monitoring errors resulting from writing hypothetical accounts of imagined attitude-relevant actions. Together, these studies suggest that the memory error account is more accurate than a memory bias account in explaining the attitude change that follows imagining attitude-relevant actions.