The Passive Acquisition of Misinformation from Social Media

By

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ABSTRACT

In this experiment, participants read fake Facebook statuses, unaware that they contained information about general world knowledge. Participants believed that they were participating in a study examining the effect of social media layouts on spatial attention. Participants in the "Correct" condition read Facebook statuses that contained correct facts. Participants in the "Neutral" condition read statuses that alluded to the target facts but did not state them outright. In the "Misleading" condition, participants read statuses identical to the "Correct" condition with the only difference being that the correct target facts were replaced with incorrect words or names. Following the readings, participants then took a spatial visualization test in order to maintain the deception that the experiment was tied to visuospatial attention and to act as a time delay. Participants were then given a 50-question test of general knowledge. The test contained questions related to the target facts from the posts in order to assess whether or not participants would use information from potentially unreliable sources to answer those questions. Participants used information from the posts to answer the questions and many believed that the information was something that they had "always known." The results suggest that people may be prone to learn misinformation from social media when we are simply "scrolling" through posts in our social networks. People may then integrate that information into their memory as something that is just known.

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CHAPTER 1

INTRODUCTION

The world has become increasingly more connected through (and reliant on) the internet and social media. People in the U.S. have a tendency to check their social media accounts around seventeen times a day and spend an average of 4.7 hours on their phones (Chang, 2015). Though many people spend most of their online time on smartphones, Americans still spend an average of around one hour online on PCs (Richter, 2015). Globally, people spend about twenty minutes a day on Facebook alone, with the average for Americans around forty minutes (D'Onfro, 2015). This near constant stream of information creates a host of opportunities for misinformation to be learned, retained, and possibly spread.

Studies have shown that people will use misinformation learned from fictional narratives to answer questions on a later test of general knowledge. While participants in those studies were often aware that they were using information from the stories to answer the questions, that information seemed to be integrated into their prior knowledge as fact. This integration led many participants to assume that the misinformation was something that they had always known (Marsh, Meade, & Roediger, 2003). Warnings about misinformation did not reduce participants' reliance on the information from fictional sources to answer test questions. This susceptibility was only reduced, but not entirely eliminated, when participants were required to press a key indicating when they saw erroneous information (Marsh & Fazio, 2006). Surprisingly, slowing the presentation speed of the stimulus did not allow participants to become any better at detecting

incorrect information, but instead led to an increase in the production of false information on a later test of general knowledge (Fazio & Marsh, 2008).

Misinformation can also be learned when people are unable to reject bad information or are unaware that the information comes from unreliable sources. If incorrect information is not belief-relevant, people often have difficulty rejecting information that runs contrary to what they already know, even when that information is blatantly false. Studies have shown that in these situations the very act of comprehending a false proposition while under cognitive load increases the likelihood that the proposition may later be considered true. It may be that, as a default, information is first considered to be true before it can be rejected (Gilbert, Krull, & Malone, 1990; Gilbert, Tafarodi, & Malone, 1993). And even when people do monitor a given information source for errors, they are not necessarily good at discerning what is and isn't misinformation (Ramsay, Kull, Lewis, & Subias, 2010). More often though, readers have a tendency not to monitor their understanding of text based on what is needed to read critically (Glenberg, Wilkinson, & Epstein, 1982) and memory errors often arise because people do not adequately monitor sources (Begg, Anas, & Farinacci, 1992). In order to reject an error, first we have to have the ability and have the motivation to do so (Prentice & Gerrig, 1999). Unless we are actively monitoring information for errors, we seem to have a tendency to believe whatever we read (Gilbert et. al. 1990). At least when reading fictional sources, the likelihood of integrating misinformation from a text does seem to dissipate when the disparity between the misinformation and the state of the world is large enough (Gerrig & Prentice, 1991).

Misinformation can also be learned in the absence of source-specific cues when people try to determine the validity of information. Individuals may be more prone to rely on their familiarity and fluency with the information when making such decisions (Henkel, 2004; Mitchell & Johnson, 2009). This effect also seems unchanged by whether or not the source is seen as credible (Henkel & Mattson, 2011). People appear to have a limited capacity in understanding where our memories and knowledge of information comes from. People generally do not mentally "tag" the time and place of the origins of our memories (Mitchell & Johnson, 2009). People are also not very good at making source attributions. When presented with new information and then later tested on it, we might feel as though we knew the information all along, despite having just seen that information for the first time (Fischhoff, 1977; Wood, 1978; Begg, Robertson, Gruppusop, Anas, & Needham, 1996; also Marsh et. al., 2003).

The focus of the present study was to see if participants would use information from potentially unreliable sources on social media to answer questions on a general knowledge test and integrate the information into their knowledge base. The design was similar to Experiment II in Marsh et. al. (2003), in which participants read narratives containing information about general knowledge. Participants were then tested on that information after a short delay. In this study, the stories used by Marsh et. al. (2003) were replaced with fake Facebook posts that were created using an online status cloning tool. People may be prone to monitor and be suspicious of information from social media when that information is presented in the form of news links or emotionally charged information. A great deal of the literature has focused on the origins and tenacity of

misinformation regarding hot-button issues such as vaccines and climate change. For an excellent review of this literature see Lewandowsky, Ecker, Seifert, Schwarz, and Cook (2012). However, people may be less likely to monitor information contained in more ordinary, every-day social media updates from friends, family, and even strangers. When individuals are "scrolling" through social media, how much of this information is retained and, if so, how is it integrated?

The present study was designed to examine whether or not participants would passively acquire information from the unreliable social media sources and then use that information to answer test questions. If so, will they believe the information to be something that they have always known?

CHAPTER 2

METHOD

Participants

One hundred and ten participants were recruited from the undergraduate psychology department research pool at Middle Tennessee State University or by word of mouth. Participants from the research pool received course credit for participation. Only native English speakers were included in this analysis, excluding eighteen participants.[1] Three participants were excluded for answering too few questions and one participant was excluded for not following directions. This left 34 male participants (M_{age} = 21.60, SD = 3.21, 18-30) and 54 female participants (M_{age} = 20.13, SD = 3.96, 18-39) for a total sample of 88, with an average age of 20.60 (SD = 3.71, 18-39). All procedures were reviewed and approved by the Institutional Review Board (IRB) and all researchers involved completed IRB training prior to the data collection process.

Design

The experiment used a 2 (Question difficulty: easy vs. hard) x 3 (Condition: correct, neutral, and misleading) between-subjects ANOVA design for the analyses of how questions were answered. Chi-square analyses were used for all situations in which both the dependent and independent measures were categorical.

[1] While there was initially no participation restriction based on language, it was decided that all non-native English speakers would be removed from analyses that did focus solely on the pre-survey data. While several non-native English speaking participants did not struggle with the general knowledge tests, many others did, even going so far as to request the use of Google Translate.

Materials

Pre-survey. The pre-survey was a one-page, paper and pencil survey which included questions about level of education, social media use, and the types of news sources which the participants used. See page 32 for the pre-survey.

Stimuli. Twenty fake Facebook status updates were created for the experiment. The statuses were created using the Status Clone Facebook cloning tool at https://statusclone.com (Hess, 2012). Each post and comment was between one and four sentences long, containing a status update followed by between one and ten comments. The faces and last names of the Facebook posters and commenters were blocked out to make the posts seem anonymized and more authentic. Ten of the fake statuses contained information about a target fact. Stimuli fell into three categories based on the experimental condition the participants were assigned to. For participants in the "Correct" condition, the target stimuli contained information about the target fact with the correct target fact present: ("He got me a necklace with a big bright red ruby"). In the "Neutral" condition, the target fact was alluded to but was not present: ("He got me a necklace with a big bright red gemstone."). In the "Misleading" condition, the target fact was framed identically to the "Correct" condition, but was replaced by a misleading target ("He got me a necklace with a big bright red emerald.").

All the target facts were taken from the updated and expanded Nelson and Narens (1980) general knowledge norms (Tauber, Dunlosky, Rawson, Rhodes, & Sitzman, 2013). Five of the target facts were classified as Easy (70% probability of recall or higher) and five of the target facts were classified as Hard (15% probability of recall and

lower). The other ten statuses were created as fillers, contained no target information, and were generally shorter than the target stimuli. These were created to help aid in the deception that the statuses had been taken from the web. The ten target questions and their correct and misleading answers can be found on page 34. Examples of the stimuli can be found on page 35. Stimulus presentation was randomized and presented on Dell Optiplex 780 computers with Windows 7 on Dell 1909W monitors via E-Prime v2.0.10 software.

Delay task. A delay task was required between the stimulus presentation and the general knowledge test. This served a dual purpose. The delay served to reinforce the deception that the experiment was examining the effects of social media layout on visual attention. The delay also served the purpose of taking attention away from the stimuli that had been presented. The Guilford-Zimmerman Spatial Aptitude Survey test was chosen as the task. The test is a timed, 10-minute pencil and paper test in which participants are asked to determine how the position of a clock had shifted relative to its starting position (Guilford & Zimmerman, 1948). The first page of the test can be found on page 36.

General knowledge test. There were three different versions of the general knowledge test containing 50 questions taken from the updated and expanded Nelson and Narens general knowledge norms. Ten of the 50 questions corresponded to the target facts contained in the stimuli. The test was three pages long, with each question followed by a blank space in which the participants were instructed to write the answer and how they knew the answer. Multiple-choice format was avoided in order to prevent possible priming effects. Participants were told not to worry about spelling. The last question on

the test asked if the participants noticed any incorrect information in the social media posts. They were instructed to circle either “Yes”, “No”, or “I don’t know”. All test versions were identical except for the order of the questions, which was randomized. Test form A can be found on pages 37 through 39.

Procedure

Upon arrival to the lab, participants were seated at individual computers and informed, written consent to participate was obtained. The consent sheet included a general description of the tasks that the participants would be completing in the experiment. Each participant was assigned an ID number that had been randomly preassigned to the Correct, Neutral, or Misleading condition using the random list generator at http://www.random.org. The assigned program was loaded on each computer. All start screens, regardless of condition, were identical. A demographic pre-survey was then administered to each participant. Following the pre-survey, participants were told that they would be viewing a series of randomly selected Facebook posts. They were also informed that the purpose of the study was to see if reading certain types of social media layouts had an immediate effect on spatial attention. They, the participants, would be completing the Facebook task in this session. The names and pictures of the people in the statuses, it was explained, were blacked out so as to preserve the posters’ anonymity. Once they were ready, the participants were instructed to press ENTER on the keyboard to start the experiment. Participants read each status one at a time. When participants finished reading a status, they were instructed to press the ENTER key to view the next status until they had finished reading all 20 statuses. No time constraints

were placed on the readings and participants were allowed to read each post at a normal pace. While the speed of presentation has been found to have an effect on the production of false information (Fazio & Marsh, 2008), it was more important, in this experiment, to see if an effect existed at participants' normal reading speed. Upon completion, they were then prompted by the program to sit quietly and wait for the other participants to finish.

Once all participants had finished the Facebook task, they were then informed that they would be taking a brief spatial visualization test. Each participant was given a paper copy of the Guilford-Zimmerman spatial visualization test, a pencil, and an answer sheet. As a group, the participants were shown how to answer each problem, how to indicate answers, and were shown some practice examples. Instruction was done in accordance with the procedures outlined in the survey (found on page 33). Once the instruction was over, participants were given ten minutes to complete as many problems as they could.

Following the Guilford-Zimmerman Test, participants were informed that the next task was a test of general knowledge. Participants were given the 50 question general knowledge test of selected Nelson and Narens revised and updated general knowledge norms. Participants were told that they would have 30 minutes to complete the task but none required the full amount of time.

At the end of the general knowledge task, participants were informed of the true intentions of the experiment and had the reason for the deception explained. Target facts were discussed, one by one, to reinforce the correct information, regardless of the test condition a participant had been in. They were then given a copy of the debriefing form to take home. The form included the correct target facts. The participants were also asked

not to discuss any aspect of the experiment with their classmates or friends until the end of the semester. Doing so, they were informed, might cause other potential participants to be aware of the true intentions of the experiment and therefore confound the results. Participants were then told that they had finished. One week following the experiment, participants were sent an email, with the debriefing form attached, reminding them to read the answers one more time to ensure that they had memorized only the correct facts.

CHAPTER 3

RESULTS

The data were analyzed in SAS and SPSS and a $\alpha_{fw} = .05$ was used for all analyses. Several analyses were performed in order to explicate results. The results of 2 one-way ANOVAs indicated that the assigned condition of the participant (Correct, Neutral, and Misleading) was not significantly related to the overall number of questions attempted, F (2, 85) = 0.77, MSE = 68.25, p = .46, nor was it related to the number of attempted target questions F (2, 85) = 0.93, MSE = 3.37, p = .40. Participants in all conditions attempted a similar number of target and non-target questions. There were also no significant differences between conditions based on whether participants indicated that they had, had not, or were unsure if they had seen misinformation in the fake Facebook statuses $\chi 2$ (4, n = 88) = 5.30, p = .26. The misinformation condition was not significantly any more (or less) likely to say they had seen misinformation in the posts than the other conditions. Only two misleading target answers were used by participants that were not in the misleading condition. One participant in the correct condition and one participant in the neutral condition both used the misleading target "Earhart" as the answer for the question regarding the first person to fly solo across the Atlantic. The likelihood of participants having learned the misinformation presented in the stimuli before the experiment was, therefore, very low.

A one-way ANOVA conducted on the effect of condition on the proportion of easy questions answered correctly found no significant differences between the correct (M = 0.94, SD = 0.13, N = 29), neutral (M = 0.90, SD = 0.25, N = 26), and misleading conditions (M = 0.92, SD = 0.16, N = 33), F (2,85) = 0.39, MSE = 0.03, p = .68. Most

participants, regardless of condition, performed poorly when answering the hard questions. This led to significant violations of normality for the dependent variables of the proportion of hard questions answered correctly and the proportion of hard questions answered incorrectly. Therefore, the data were rank transformed and Kruskall-Wallis tests were performed on the ranked data with Mann-Whitney *U* pairwise comparisons. The Kruskall-Wallis *H* test is a rank-based nonparametric test used to determine if there are statistically significant differences between two or more groups of an independent variable on a continuous or ordinal dependent variable; essentially a one-way ANOVA on ranked data. Likewise, the Mann-Whitney *U* test is, essentially, a non-parametric *t*-test on ranked data. Additionally, because the numbers of attempted hard questions varied greatly between participants, separate analyses were conducted on the proportion of hard questions answered correctly and the proportion of hard questions answered incorrectly.

Median change in the proportion of hard questions answered correctly between conditions was significant $\chi 2$ (2, n = 88) = 8.03, p = .02, η^2 = .09. Mann-Whitney *U* pairwise comparisons were conducted with a Dunn adjusted α=.0167 to control the Type I error rate. No significant differences were found between the Correct and Neutral conditions (p = .03) or the Misleading and Neutral Groups (p = .67). Participants in the Misleading condition answered significantly fewer questions correctly than those in the Correct condition (p = .01).

Median change in the proportion of hard questions answered incorrectly between conditions was significant, $\chi 2$ (2, n = 88) = 21.73, p < .01, η^2 = .25. Mann-Whitney *U* pairwise comparisons were conducted with a Dunn adjusted α = .0167. No significant

differences were found between the Correct and Neutral conditions ($p = .10$). However, participants in the Misleading condition answered significantly more questions incorrectly than those in the Correct condition ($p < .01$) and Neutral condition ($p < .01$). Table 1 on page 27 contains descriptive statistics for the Kruskall-Wallis tests and Table 2 on page 28 contains Mann-Whitney *U* pairwise comparisons. Charts of the proportions of question responses by condition can be found in Figures 1 & 2 on pages 31 and 32 respectively.

Whether or not a participant indicated that they used information from the Facebook posts to answer easy questions was then analyzed. There were no significant differences between the Correct, Neutral, and Misleading conditions $\chi 2$ (2, n = 88) = 0.88, $p = .64$. There were, however, significant differences between conditions for hard questions $\chi 2$ (2, n = 88) = 9.45, $p < .01$ Almost twice as many participants in the Misleading condition (30.3% of the condition) indicated that they used information from the Facebook posts to answer questions than what was expected by the Chi-square analysis (10 counted versus 5.6 expected).

It would be difficult to ascertain from the data whether participants in the correct condition used the information in the posts to answer questions or if they actually knew the correct facts all along. Even though the participants indicated that they either knew the information or used the Facebook posts, it is important to take into account the trouble that people have with making source attributions. Therefore, the focus of the analysis turned to the misleading target information. Participants in the Misleading condition were significantly more likely than chance to use the target misleading facts to

answer questions $\chi 2$ (2, n = 88) = 41.31, $p < .01$. Of the participants in the misleading condition, 66.70% used at least one misleading fact to answer target questions.

Also of interest was whether or not the effect for condition would remain when analyzing only answers that were thought by participants to be facts they knew prior to the experiment. A new variable was then computed for the proportion of hard questions answered with a misleading target by participants who indicated that they had known that information prior to the experiment. The results of the Kruskall-Wallis test with Dunn adjusted Mann-Whitney *U* pairwise comparisons on median ranks found significant differences between the Correct (M=37.98, N=29), Neutral (M = 38.15, N = 26), and Misleading (M = 55.23, N = 33) conditions, $\chi 2$ (2, $n = 88$) = 20.77, $p < .01$ Participants in the misleading condition answered more questions with the misleading target facts (while believing that they knew the information prior to the experiment) than those in the correct condition ($p < .01$). Participants in the misleading condition also answered significantly more questions with "previously known" misinformation than in neutral condition ($p < .01$). There were no significant differences between the correct and neutral conditions ($p = .94$).

Responses to the hard questions were then analyzed for each question one at a time. Though the relative contribution of each question to the overall effect was not one of the original research questions, patterns that arose in the data during analysis made this question worth answering. The results of Pearson Chi-Square tests on the relationship of condition and whether or not participants used the misleading target to answer hard questions found significant relationships for only two questions. For question H1 ("What

is the last name of the first person to complete a solo flight across the Atlantic Ocean?"), 57.6% of participants in the misleading condition used the target misleading fact "Earhart" ($p < .01$). For question H5 ("What is the last name of the artist who painted 'The Persistence of Memory'?"), 18.2 % of participants in the misleading condition (n=2) used the target misleading fact "Picasso" ($p < .01$). However, only nine participants total answered question H5, so drawing too many conclusions from that question would be inappropriate. The results of the individual Pearson Chi-Square tests can be found in Table 3 on page 29.

CHAPTER 4

DISCUSSION

Use of Information from the Facebook Posts

First and foremost, it was of interest to see if participants would use information from unreliable social media sources to answer questions on the general knowledge test. With a few exceptions, the results of this experiment seem to resemble those found in previous literature. Marsh et. al. (2003) found that participants would recall misleading targets for easy questions. An effect for easy questions was not found in this study. This may be due to the speed with which participants read the posts. Fazio and Marsh (2008) found that a slower stimulus presentation speed allowed for the production of more false facts on a later general knowledge test. The length of the posts may have also mediated the likelihood of retaining misinformation. Glenberg et. al. (1982) found that participants had trouble critically monitoring their understanding of a text when the information was imbedded in three-paragraph blocks versus a single paragraph. The fact that the target stimuli were not contained within a narrative form (as used in the previous literature) and the ease of the questions themselves were also likely contributors to the lack of effect.

Responses to the hard questions seem to resemble the findings in previous literature. Participants did use information from the Facebook posts to answer test questions. Though statistically significant, many of effects were not as large as those seen in previous literature. The effect of misinformation has been shown to strengthen over repeated readings (Marsh et. al., 2003; Marsh & Fazio, 2006; Fazio & Marsh, 2008). It is unlikely that a person will read the same social media post over and over. Therefore, the study was designed so that participants read each post only once. With repeated readings,

there would likely be a somewhat stronger effect for condition, possibly even for the easy questions. Even without the repetitive readings and narrative format, the misinformation effect found in fiction-related research seemed to persist even for banal social media posts written by “strangers”.

Source Attributions

In keeping with previous studies, many participants seemed to integrate the information from the posts into their own knowledge. Many participants indicated on the general knowledge test that the information was something that they had known prior to the experiment. Others indicated that they used information from the social media posts. We can only speculate about whether or not participants in the Correct condition actually knew the information prior to the experiment. However, it is unlikely that participants in the Misleading condition would have known the misleading target information prior to the experiment. On their general knowledge test, Marsh et. al. (2003) had participants indicate if they had seen each answer in the stories. This approach was not used in the current study. It was thought that not doing so might allow for a better deception. Asking participants if they had seen the information in the statuses may have affected their responses. Therefore, a more organic and uncued method of making source attributions was utilized. Additional studies may utilize the former approach. A frequency table of source attributions for each question by condition can be found in Table 4 on page 30.

Further Analysis

It may also be true that the degree to which the misleading target and the target information are semantically related moderates the probability of recall. Questions H1 and H5 were the only two questions in which the misleading targets were recalled significantly more than chance. It may have been that the questions were the two in which the misleading target existed strongly within the same semantic domain as the correct target. Both Earhart and Lindberg were famous pilots who flew over (or into, in Earhart's case) an ocean. Likewise, both Dali and Picasso were famous painters. Participants'' familiarity and fluency with the information may have been a factor in recall as well (Henkel, 2004; Henkel & Mattison, 2011). Earhart and Picasso would likely be names that participants had encountered previously. Question H2, "Over which river is the George Washington Bridge?" had a correct answer of "Hudson" and a misleading answer of "Delaware". Participants in the misleading condition that recalled "Delaware" may have associated George Washington with the Delaware River based on Revolutionary War history or even art history. While the differences in recall were not statistically significant, the *p* value for the Chi-Square (.18) was much smaller than for the question H4, regarding the Apollo 11 lander ($p = .48$). For the question H3, regarding Buffalo Bill's last name, every participant left the question blank or put down a completely incorrect answer (usually just "Bill"). A combination of familiarity, fluency, and semantic relatedness may therefore mediate the probability of passively retaining and integrating misinformation when we are passively reading a text.

Limitations and Further Study

Given the findings of this study, the first step may be to examine how or if the semantic relatedness of the correct and incorrect targets (with each other and with the target information) affects the probability of recall. Secondly, normality issues in this experiment led to an inability to perform more complex analyses involving interactions between the easy and hard questions. A factorial model with the fact-framing (correct, neutral, and misleading) being a within subjects factor instead of a between subjects factor (akin to the model used in Marsh et. al. (2003) would allow for greater statistical power. This model might also alleviate some of the issues with normality. In order to see if the effects are long-lasting, adding a week-long retention interval might also be worth considering. Some of the effects from Marsh et. al. (2003, Experiment III) persisted after a one-week delay. Additionally, comparing the time that it takes participants in the misleading condition to read through all the posts, versus the participants in the correct and neutral condition, may warrant examination. Rapp (2008) found that participants reading inaccurate outcomes in stories took longer to read those stories versus participants that read accurate outcomes (see also Gerrig & Prentice., 1991; Fazio & Marsh, 2008). If the format of the stimulus presentation was changed to a mobile application-based design in which participants would swipe through the posts, it might provide a simulation of Facebook reading closer to what most people may be used to. It is also worth examining the role that semantic relatedness, information fluency, and information familiarity may play in whether or not misinformation is retained and integrated from social media. While further research is required before any confident

statements can be made, the data do seem to show that people will unknowingly learn and use misinformation from social media sites that many or most of us use frequently.

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APPENDICES

APPENDIX A

TABLES AND FIGURES

Table 1

Descriptive Statistics for Kruskall-Wallis Analysis of Variance Tests

	N	*M*	*SD*	χ^2	*p*
Answered Correctly					
Kruskall-Wallis	88.00	44.50	19.39	33.50	.02*
Condition					
Correct	29.00	52.81			
Neutral	26.00	41.25			
Misleading	33.00	39.67			
Answered Incorrectly					
Kruskall-Wallis	88.00	44.50	23.25	21.73	<.01*
Condition					
Correct	29.00	31.64			
Neutral	26.00	40.88			
Misleading	33.00	58.65			

Note. M=Mean rank.

Table 2

Mann-Whitney U Pairwise Comparisons on the Ranks of Proportions of Responses to Target Questions

	Mean Rank	*Sum of Ranks*	*U*	*Z*	*p*
Hard Questions Answered Correctly					
Correct	31.53	914.50	274.50	-2.12	.03
Neutral	24.06	625.50			
Correct	36.28	1052.00	340.00	-2.50	.01*
Misleading	27.30	901.00			
Neutral	30.69	798.00	411.00	-0.42	.67
Misleading	29.45	972.00			
Hard Questions Answered Incorrectly					
Correct	25.14	729.00	294.00	-1.64	.10
Neutral	31.19	811.00			
Correct	21.50	623.50	188.50	-4.50	<.01*
Misleading	40.29	1329.50			
Neutral	23.19	603.00	252.00	-3.00	<.01*
Misleading	35.36	1167.00			

Table 3

Pearson Chi-Square Tests on Relationship of Condition and Use of Target Misinformation on Hard Questions (n=88)

Question	Correct Answer	Misleading Target	$\chi 2$	*df*	*p*
H1	Lindbergh	Earhart	33.03	2	<.01*
H2	Hudson	Delaware	3.41	2	.18
H3	Cody	Bradley	.	.	.
H4	Eagle	Hawk	1.69	2	.43
H5	Dali	Picasso	10.73	2	<.01*

Note. H3 not calculated as no participants used target misinformation to answer the question.

Table 4

Proportions of Source Attributions for Each Target Question by Condition.

		Question									
Condition		E1	E2	E3	E4	E5	H1	H2	H3	H4	H5
Correct	Total	25	29	21	21	27	12	7	5	7	1
	JK	.88	1.00	1.00	1.00	1.00	.75	.71	.80	.71	.00
	FB	.12	.00	.00	.00	.00	.25	.29	.20	.29	1.00
Neutral	Total	22	22	18	19	25	5	5	2	8	2
	JK	1.00	1.00	1.00	1.00	.96	1.00	1.00	1.00	1.00	1.00
	FB	.00	.00	.00	.00	.04	.00	.00	.00	.00	.00
Misleading	Total	30	27	26	24	29	24	5	6	7	6
	JK	.97	.96	1.00	.96	1.00	.75	.80	1.00	.86	.33
	FB	.03	.04	.00	.04	.00	.25	.20	.00	.14	.67

Note: Total = Total number of responses.

JK = Proportion of participants who indicated that the information was previously known.

FB = Proportion of participants who indicated that they used the information from the Facebook post to answer the question

Figure 1

Proportion of Target Questions Answered Correctly by Condition

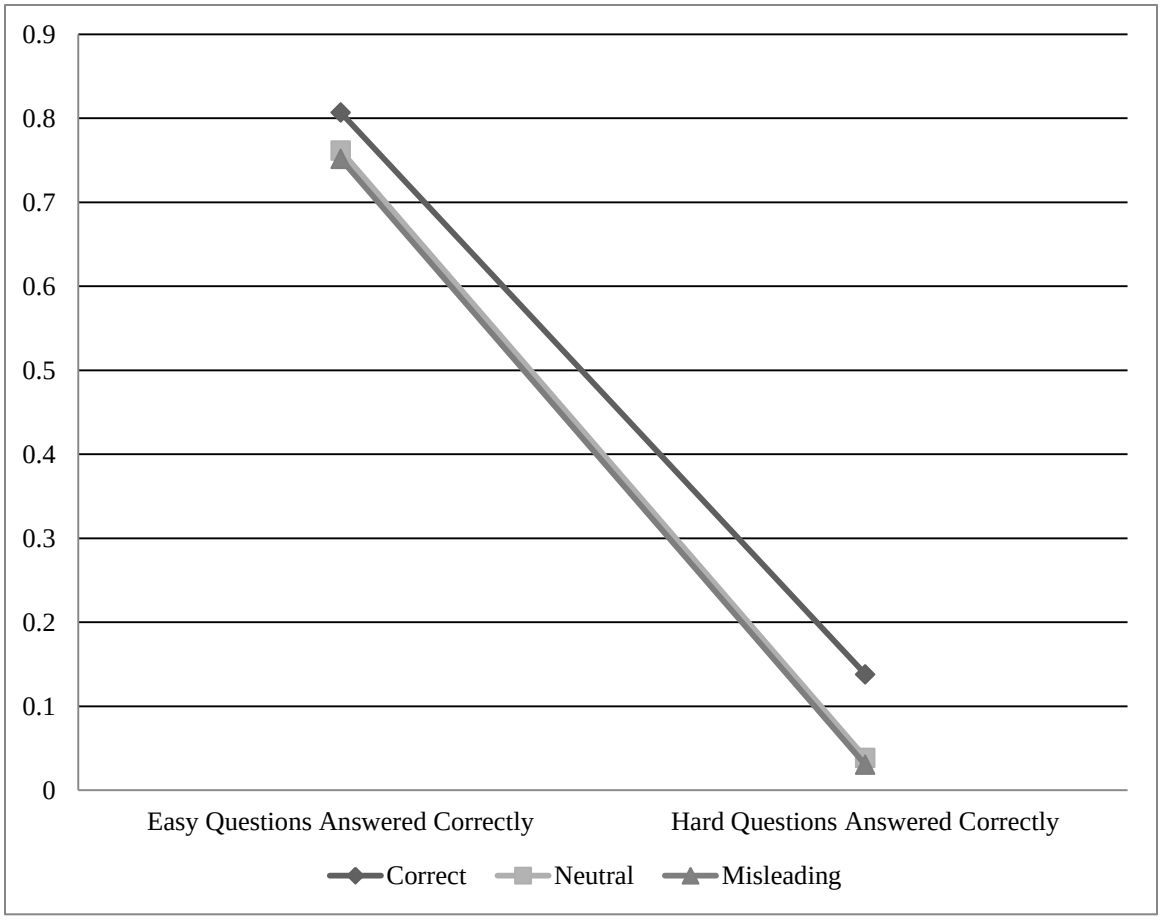
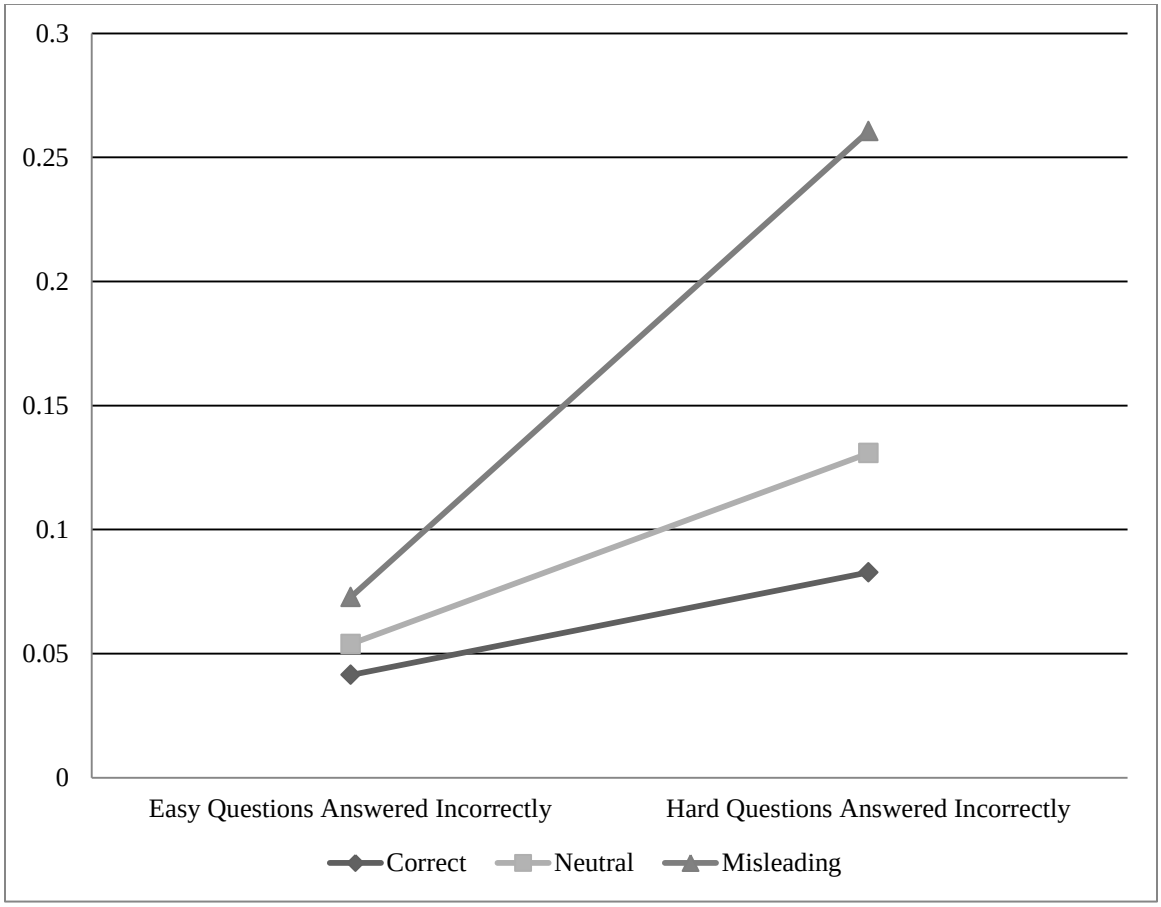


Figure 2

Proportion of Target Questions Answered Incorrectly by Condition



APPENDIX B – DEMOGRAPHIC PRE SURVEY

Pre Survey for Experiment (16-2115)

Department Use Only

ID# Time:

Please fill out the information below. If you feel uncomfortable answering any of the questions, you may leave them blank.

1. Age _____

2. What is your gender? (circle)

Male Female Transgender Male Transgender Female Gender Nonconforming

If none of the above accurately describe you, please enter your gender. _____

3. Is English your native language? (circle) **Yes** **No**

4a. Are you currently enrolled in an institution of higher learning ?(circle)

Yes **No**

4b. If so, please state your declared major and institution of enrollment:

_____

5. Highest level of education completed (check one)

- ◯ High school/GED or below
- ◯ Some college
- ◯ 2 year degree
- ◯ Bachelors degree
- ◯ Some graduate level coursework
- ◯ Masters
- ◯ Doctorate

6. About how much time each day do you spend on social media? (check one)

- ◯ Less than 30 minutes
- ◯ 30 minutes to 1 hour
- ◯ 1 to 2 hours
- ◯ More than 2 hours

7. What is your preferred social media platform (Facebook, Instagram, etc.)

_____

8. Where do you usually get your news? (check all that apply)

- ◯ Website (which ones?) _____
- ◯ TV (which ones?) _____
- ◯ Social Media (which ones?) _____
- ◯ Radio Program (which ones?) _____
- ◯ Newspaper (which ones?) _____
- ◯ Friends and family
- ◯ I don't follow the news at all

APPENDIX C - LIST OF TARGET QUESTIONS WITH ANSWERS

EASY QUESTIONS	Probability of Recall*	Correct	Misleading
WHICH PRECIOUS GEM IS RED?	.849	Ruby	Emerald
WHAT ANIMAL RUNS THE FASTEST?	.816	Cheetah	Gazelle
WHAT IS THE LAST NAME OF THE FIRST PERSON TO SET FOOT ON THE MOON?	.741	Armstrong	Glenn
WHAT IS THE CAPITAL OF FRANCE?	.730	Paris	Lyon
WHAT IS THE NAME OF AN INABILITY TO SLEEP?	.714	Insomnia	Halitosis
HARD QUESTIONS			
WHAT IS THE LAST NAME OF THE FIRST PERSON TO COMPLETE A SOLO FLIGHT ACROSS THE ATLANTIC OCEAN?	.052	Lindbergh	Earhart
OVER WHICH RIVER IS THE GEORGE WASHINGTON BRIDGE?	.042	Hudson	Delaware
WHAT WAS THE LAST NAME OF BUFFALO BILL?	.030	Cody	Bradley
WHAT WAS THE NAME OF THE APOLLO LUNAR MODULE THAT LANDED THE FIRST MAN ON THE MOON?	.025	Eagle	Hawk
WHAT IS THE LAST NAME OF THE ARTIST WHO PAINTED "THE PERSISTENCE OF MEMORY"?	.015	Dali	Picasso

*Based on the updated and expanded Nelson & Narens general knowledge norms (Tauber, Dunlosky, Rawson, Rhodes, & Sitzman, 2013)

APPENDIX D - EXAMPLE OF TARGET STIMULI

Question H5: “What is the last name of the artist who painted The Persistence of Memory?” The target fact in this example is the name of the painter.

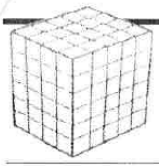
Correct Condition Stimulus

Neutral Condition Stimulus

Misleading Condition Stimulus

APPENDIX E - FRONT PAGE OF THE GUILFORD – ZIMMERMAN SPATIAL VISUALIZATION TEST (1948)

The Guilford-Zimmerman Aptitude Survey



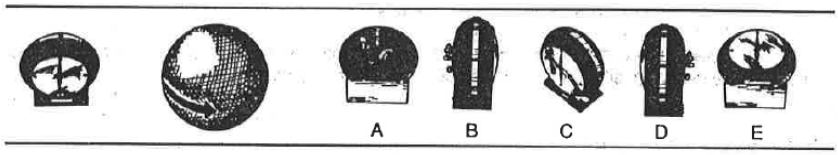
Part 6/Spatial Visualization

Name _____ Date _____ Score _____ Sex: M F

INSTRUCTIONS.

This is a test of how well you are able to visualize spatial position. In each item you are to note how the clock would move if it were moved as indicated by the arrow on the sphere.

Here are some sample items.



The first picture at the left shows a clock. Next to it is a sphere with an arrow marked on it. The arrow shows how the clock is to be moved. This move is illustrated (in two steps) in the picture below. When the clock is moved to the one-quarter turn shown by the arrow, it is then in position B. B is therefore the correct answer. You would record this by darkening the answer space right below B on your answer sheet. (But do not record answers to sample items.)

Original Position

Position after the move has been completed

Consulting Psychologists Press, Inc., 3803 E. Bayshore Road, Palo Alto, CA 94303 0041R

APPENDIX F – VERSION A OF THE GENERAL KNOWLEDGE TEST

General Knowledge Test **A**

ID_____

Answer under each question and indicate where you learned the answer from or if you "just know".
If you don't know the answer, just leave it blank. Don't worry about spelling.

1. What is the name of a dried grape?

2. What is the name of the long sleep some animals go through during the entire winter?

3. Who was the leader of the Argonauts?

4. What is the largest planet in the solar system?

5. What is the name of the horse-like animal with black and white stripes?

6. For which country is the rupee the monetary unit?

7. What is the last name of the author who wrote "Romeo and Juliet"?

8. What animal runs the fastest?

9. What is the largest ocean on earth?

10. In what European country is Athens located?

11. What is the name of the rubber object that is hit back and forth by hockey players?

12. What is the name of the severe headache that returns periodically and often is accompanied by nausea?

13. What is the last name of the brothers who flew the first airplane at Kitty Hawk?

14. Of which country is Baghdad the capital?

15. What is the name of an inability to sleep?

16. What is the name of a giant ocean wave caused by an earthquake?

17. What is the name of the supposedly unsinkable ship which sunk on its maiden voyage in 1912?

18. What is the name for a cyclone that occurs over land?

19. Over which river is the George Washington Bridge?

20. What is the name for astronomical bodies that enter the Earth’s atmosphere?

21. What is the name of the large hairy spider that lives near bananas?

22. The deepest part of the ocean is located at which trench?

23. What is the last name of the artist who painted “The Persistence of Memory”?

24. What is the name of the Lizard that changes its color to match the surroundings?

25. What is the name of Batman's butler?

26. What is the name of the comic strip character who eats spinach to increase strength?

27. What is the last name of the first person to climb Mount Everest?

28. What is the name for a medical doctor who specializes in cutting the body?

29. What was the last name of Buffalo Bill?

30. What is the name of the first person to set foot on the moon?

31. Which sport uses the terms "gutter" and "alley"?

32. What is the capital city of New York?

33. What is the name of the process by which plants make their food?

34. What is the last name of the man who assassinated John F Kennedy?

35. What is the name of Socrates' most famous student?

36. What is the name of a young sheep?

37. What is the last name of the villainous captain in the story "Peter Pan"?

38. What was the name of the Apollo Lunar module that landed the first man on the moon?

39. What is the name of the molten rock that runs down the side of a volcano during an eruption?

40. What is the name of remains of plants and animals that are found in stone?

41. What is the last name of the author who wrote "The Murders at the Rue Morgue"?

42. What is the last name of the author who wrote "Oliver Twist"?

43. What is the name of deer meat?

44. What is the name of Dorothy's dog in "The Wizard of Oz"?

45. What is capital of France?

46. What is the longest river in South America?

47. What is the name of an airplane without an engine?

48. What is the last name of the first person to complete a solo flight across the Atlantic Ocean?

49. What is the unit of sound intensity?

50. Which precious gem is red?

Did you notice any incorrect information in the Facebook posts? (circle)

Yes No I don't know

APPENDIX G – IRB APPROVAL LETTER

12/16/2015

Investigator(s): Andrew Hunt
Department: Psychology
Investigator(s) Email: aph2j@mtmail.mtsu.edu

Protocol Title: "Does Facebook affect how I see: the effect of social media layout on spatial attention "

Protocol Number: 16-2115

Dear Investigator(s),

The MTSU Institutional Review Board, or a representative of the IRB, has reviewed the research proposal identified above. The MTSU IRB or its representative has determined that the study poses minimal risk to participants and qualifies for an expedited review under 45 CFR 46.110 and 21 CFR 56.110, and you have satisfactorily addressed all of the points brought up during the review.

Once the following changes are submitted, approval is granted for one (1) year from the date of this letter for 400 participants:

Please note that any unanticipated harms to participants or adverse events must be reported to the Office of Compliance at (615) 494-8918. Any change to the protocol must be submitted to the IRB before implementing this change.

You will need to submit an end-of-project form to the Office of Compliance upon completion of your research located on the IRB website. Complete research means that you have finished collecting and analyzing data. **Should you not finish your research within the one (1) year period, you must submit a Progress Report and request a continuation prior to the expiration date.** Please allow time for review and requested revisions. Failure to submit a Progress Report and request for continuation will automatically result in cancellation of your research study. Therefore, you will not be able to use any data and/or collect any data. Your study expires Expiration date- 1 year from approval..

According to MTSU Policy, a researcher is defined as anyone who works with data or has contact with participants. Anyone meeting this definition needs to be listed on the protocol and needs to complete the required training. **If you add researchers to an approved project, please forward an updated list of researchers to the Office of Compliance before they begin to work on the project.**

All research materials must be retained by the PI or faculty advisor (if the PI is a student) for at least three (3) years after study completion and then destroyed in a manner that maintains confidentiality and anonymity.

Sincerely,

Michelle Stevens, PhD
Institutional Review Board
Middle Tennessee State University