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This between-subjects design study focuses on the effects of a visual cue on reaction time. Participants started the study by completing an online reaction time test and their performance was recorded. Then, they were exposed to a visual cue in the form of a 2-min video clip of a man dancing. Each participant was assigned to one of two conditions. Participants in one condition watched the video at a decreased speed (i.e., slower), whereas participants in the other watched the video at an increased speed (i.e., faster). Then, the participants were asked to complete a second online reaction time test. The difference in the participants' performance on the two reaction time tests were used as the dependent measure to determine whether their reaction times were affected by exposure to a visual cue presented in a faster or slower speed. I hypothesized that the speed of the video would affect the speed of the participants' reaction time so that the participants who watched the faster video in between the reaction time tests would see a decrease in their reaction time (i.e., respond more quickly) whereas those who watched the slower video in between the tests would show an increase in their reaction time (i.e., respond slowly). My hypothesis was not supported; the study resulted in no significant effect of a visual cue and the participants' reaction time differences.

The purpose of this study is to see if a visual cue can subconsciously affect a person's behavior. I have always been intrigued by the well known psychological concept of priming. The term describes the idea that behavior can be triggered automatically by previously experienced situations and events (Bargh, Chen, & Burrows, 1996). Can a person's reaction time improve just from watching a video at an increased speed?

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There has been research on priming in the past. One study in particular conducted by Bargh et al. (1996) focused on how verbal cues affect participant's behavior. The verbal cues were presented in three individual experiments. I am going to discuss the two experiments from Bargh et al. (1996) that influenced my own research study. The first experiment had the participants complete a scramble-sentence test that consisted of three groups of stereotypical words (polite, rude, and neural words). Participants were given one of three envelopes of stereotypical words and were instructed to complete grammatical sentences. After completing the sentences, the participants were told to let the researcher know they were finished. The researchers waited for the participants while talking to a confederate. The point of the study was to time how long the participants waited before interrupting the researcher and the confederate. The results supported Bargh et al.'s (1996) hypothesis that the participants would interrupt the confederates faster when conditioned with the rude word scramble-sentence test compared to the participants in the other two conditions.

The second experiment in Bargh et al.'s (1996) study required participants to complete the same scramble-sentence tests as before but with age stereotypical word lists. This included a list of elderly stereotypical words and a list of neutral words. The participants were told to walk down a hall and were unknowingly timed. Bargh et al. (1996) predicted that the participants in the elderly word condition would walk slower compared to the participants who were given the

list of neutral stereotypical words. The results of Bargh's et al. (1996) research study supported his hypothesis that the stereotypical words that were presented subconsciously influenced participant's behavior. I was fascinated with the idea that the types of words affected the participants' actions and wanted to try and replicate Bargh et al.'s (1996) study but instead of just giving the participants words to look at as a visual cue, I wanted to show them a more stimulating visual cue such as a video clip.

There has already been research conducted that looked at the effects of a visual cue in the form of a digital or electronic stimulus. One study in particular was set up to study the effects of video games on a given lexical decision task. Specifically, Bosche (2010) had participants play either a violent or non-violent video game for 20 min and then tested the participants with a task containing violent and non-violent words. Bosche's (2010) data challenged his hypothesis that violent video games stimulate negative concepts only because the results from the study revealed that the violent video games primed both aggressive and positive thoughts. Even the simple fact that the violent video game impacted the participants' response in general is worthy of further investigation.

At first, it seemed unrealistic to me to be able to subconsciously influence a person's behavior with cues. I thought that our brains were too advanced for this and that it would only work in people who were diagnosed with a condition that affected one's cognitive functions.

Rossell, Shapleske, and David's (2000) research challenged my idea that people with unhealthy brain functioning would be more susceptible to priming compared to people without abnormal brain functioning. Rossell et al. (2000) compared a group of schizophrenic patients experiencing delusions and a group of schizophrenic patients not experiencing delusions. Each group of patients completed a lexical decision task after being exposed to one of the three emotional word pairs (positive, negative, or neutral). The results concluded that indirect semantic priming is consistently present in the normal control subjects, non-deluded subjects, and deluded subjects The results helped Rossell et al. (2000) better understand why schizophrenic patients experience dysfunctional cognitive functioning in the brain that result in things such as delusions.

Similarly, there has been research done in the past that found that amnesic patients exhibit priming effects even after having major brain trauma (Ochsner, Chiu, & Schacter, 1994). Ochsner et al. (1994) reviewed past researcher studies and discussed the ideas of priming on patients with brain damage. Previous researchers gave participants, who were diagnosed with a brain injury resulting in amnesia, word stem completion tasks. Just like the results of the participants with delusions resulting from schizophrenia, the results of the individual word stem completion tasks found that the participants with amnesia were capable of being primed.

Many people, just like me, have been interested in the idea of priming thanks to Bargh et al.'s (1996) famous study that focused on priming with verbal cues. There has been some debate

on the creditability of the findings from the study conducted by Bargh et al. (1996). Since the study was conducted, multiple researchers have tried to replicate the study with no prevail. One researcher in particular replicated the original study with two exceptions; the researchers used an automated timing method compared to Bargh et al.'s stopwatches, and they also tested a larger sample of 120 participants compared to the 60 participants in Bargh et al.'s study (Doyen, Klein, Pichon, & Cleeremans, 2012). In my opinion, these two changes in the original study's design should improve the chance for significant results. The automated timing method was more reliable than someone manually controlling a stop watch and the larger sample size is more related to the population. But surprisingly, the results did not support neither Doyen et al.'s (2012) hypothesis nor the original hypothesis that participants who were exposed to words related to old age would walk slower when measured compared to the participants who were not in the old age condition.

The study at hand was conducted in order to determine whether a visual cue would impact people's reaction time. There were two different conditions in the study. The first condition required the participant to complete the reaction time tests and watch a video that was presented at an increased speed. The other condition was exactly the same but the video speed was decreased. I was focused on the difference between the first reaction time test the participants took and the second reaction time test the participants took after they watched the

video. I hypothesized that the participants who watched a video with two times the normal speed would have an increased reaction time speed on the first reaction time test compared to the second reaction time test.

Method

Participants

There were a total of 14 participants recruited from the Lindenwood Participant Pool (LPP). The LPP allows Lindenwood University students who are enrolled in qualifying classes at Lindenwood University to sign up online for research studies approved by Lindenwood University' Institutional Review Board. The experiments started on March 9th, 2015 and ended on April 18th, 2015. These students received extra credit in their qualifying classes for their participation in the study. The minimum age for the participants was 18 years old and the average age of the participants was 20 years old. Out of the 14 participants, 5 of them were male students and 9 of the participants were female students. There were no participants with visual impairments that disabled them from viewing the video or the reaction tests. The average amount of hours that participants stated that they played video games per day was about 1.2 hours. To my surprise, 5 out of the 14 participants stated that they spent zero hours of the day playing video games.

Materials

The room that the study took place in was one of the rooms available through the LPP. The rooms included chairs, a table, and my laptop. The LPP requires all participants to fill out a participant sheet to keep track of who participates in research studies. A LPP participant receipt was also filled out for each individual in order for the participants to receive their extra credit. Participants were required to read and sign two consent forms that made it clear that the person could opt out of participating at any time throughout the study (see Appendix A).. One of the consent forms was for the participant and the other one I kept. The participants also completed a demographic survey. The survey consisted of four questions (see Appendix B).

There are two online reaction tests that the participants completed on my laptop; test one (http://getyourwebsitehere.com/jswb/rttest01.html) is a stoplight reaction test and test two (http://www.humanbenchmark.com/tests/reactiontime) is a full screen color test and. Both of the tests have easy to follow instructions for the participants to read and both tests compute the average after five timed trials. I randomly assigned the order of the tests to the participants so that there were an equal number of participants in the slow video condition as the fast video condition taking the tests in a particular order. I wanted to limit error by systematically changing the order of the tests so that the participants did not naturally do better on the second test since they were used to the format and buttons after completing the first test. I systematically altered

the order of the reaction time tests for each participant so that the order rotated after every two participants. The two tests are measuring the same thing, reaction speed, and their format is fairly similar enough to not skew the data (Both tests have five timed trials). I kept track of everyone's average times in a chart that organized everyone's times (see Appendix C).

The first reaction test is a full screen reaction test where the participants have to click the mouse when the screen turns from the color red to the color green. After five trials the test averages out the participants reaction times (http://www.humanbenchmark.com/tests/reactiontime). The second reaction test is very similar to the first except that instead of the computer screen changing colors there is an animation of a stoplight that the participant watched. When the stoplight changes from red to green the participant has to click a button. Similar to the first test, the test averages out the participant's five trials (http://getyourwebsitehere.com/jswb/rttest01.html). Each participant was given a sheet of paper with the instructions to the reaction tests printed on it (see Appendix D).

The video is a Youtube video of a man dancing; it is called "How to Shuffle: Basic 'Smoothstyle' Tutorial" (http://youtu.be/yWClxRC7-0s?t=10m49s). The participants only watched the last 2 min of the video when a man is dancing to background music. The video was presented on my personal laptop (the same laptop that the reaction time tests were taken on) with the volume turned up to 100%. The participants did not wear headphones.

Procedure

All of the participants were recruited from Lindenwood's Participant Pool (LPP). The study began with me handing out the consent forms for the participant to read and sign (see Appendix A). They were be given two, one they took with them and one that I kept. The consent forms are the only part of the study that has identifying markers on them and were kept separate from any data collected. The participants then completed the demographic survey. Next, the participants were assigned to complete one of the two reaction tests (http://www.humanbenchmark.com/tests/reactiontime and http://getyourwebsitehere.com/jswb/rttest01.html). Their average time was recorded on my data sheet anonymously (see Appendix C). I kept the chart and all other paperwork in my locked filing cabinet. All of my electronic calculations are stored in a password encrypted file on my personal laptop. The next thing the participants did was watch the last 2 min of a video (http://youtu.be/yWClxRC7-0s?t=10m49s) with either the speed of the video increased or decreased. The participants were randomly assigned to one of the two video conditions. After the video, the participants immediately completed the second reaction time test. Just like the first one, the participants completed five trials and I took the average time of the five.

After the participants were done with the experiment, I gave every participant a copy of the feedback letter (see Appendix E) and their participant receipt for the LPP office that they

need in order to receive their compensation in the form of extra credit toward their LPP participating class

Results

I hypothesized that the speed of the video will affect the speed of the participants' reaction time so that the participants who watched the faster video in between the reaction time tests would show a decrease in their reaction time (i.e., respond more quickly) whereas those who watched the slower video in between the tests would show an increase in their reaction time (i.e., respond slowly). An independent sample *t*-test was conducted to determine whether people's reaction times changed based on the speed of the video they watched between the pre-test and post-test reaction time tests. I wanted to see if the video speed affected the post-test reaction time compared to the pre-test. There was no significant relationship between difference in reaction time and the video conditions, $t(12) = -.478$, $p = 0.641$.

A paired sample *t*-test was conducted to compare individual pre-test and post-test reaction times. I found that on average, the post-test reaction time scores were faster than the pre-test reaction time scores. I found no statistically significant mean difference between the pre-test scores ($M = 0.410$, $SD = 0.113$) and the post-test scores ($M = 0.383$, $SD = 0.023$), $t(13) = 0.996$, $p = 0.337$.

Discussion

The results from the study did not support my hypothesis. There was no statistically significant effect of video speed on the participants' reaction times. This could be due to the fact that the video was not powerful enough to stimulate an effect. It could also be possible that the participants did not fully attend to the video and therefore, they were not stimulated by the speed of the video. Unlike Bargh et al. (1996) who found a significant effect from the visual cue given to the participants on their measured action, the visual cue given in my study did not have an effect on the participant's reaction times.

Unfortunately, very few participants took part in my study. In the future, more participants should be tested before analyzing the data. Some participants encountered possible interruptions such as the air conditioning unit coming on while three of the participants were watching the video. This made the video hard to hear. Another issue that I ran across was Lindenwood's wireless internet. During two of the participation's time the internet was loading slowly and it caused the study to be delayed. These two participants had to wait longer for me to start the study and could have become impatient. It was noticed that a confound variable was unknowingly present in the study. The participants who stated that they played more than 2 hours of video games per day were not purposely placed in the fast speed video condition.

In the future, a different visual cue could be used to prime the participants. I think the speed of the video needs to be more noticeable compared to the video that I chose for this experiment. Instead of a man dancing, a video of a common slow activity (such as an old person in a walker) could be sped up to a noticeably increased speed, and a video of a fast activity (such as a bird flying) should be slowed down a considerable amount. The drastic speed manipulation of the video might make the participant notice the speed and pay more attention to what is going on in the video. Even though my results support Doyen et al.'s (2012) idea that Bargh et al.'s (1996) study is non- replicable, I believe that with a more sophisticated presentation to view the stimuli and a larger population of participants the results could potentially support the idea that a visual cue can affect a person's behavior.

References

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Appendix A

Informed Consent Form

I _____ (print name), understand that I will be participating in a research project that requires me to fill out a demographic questionnaire, watch a short 1-2 minute video clip, and complete two reaction games, one which I will do before I watch the video and one which I will do after I watch the video. I understand that I should be able to complete the entire study within 10 minutes. I understand that I am allowed to skip any questions that make me feel uncomfortable answering on the questionnaire. I understand that my participation in this study is voluntary, and I can withdraw from the research at any time without penalty. I understand that the information obtained from my responses will be analyzed only as part of aggregate data, and that identifying information will be absent from the data in order to ensure anonymity. I understand that my responses will be kept confidential and that the data collected from this study will be available for research and educational purposes. I also understand that any questions about this study will be answered by the researcher involved to my satisfaction. Lastly, I verify that I am at least 18 years of age and am legally able to consent or that I am under the age of 18 but have on file with the LPP office, a completed parental consent form that allows me to give consent as a minor.

_____ Date: _____
(Signature of participant)

_____ Date: _____
(Signature of researcher obtaining consent)

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Appendix B
Reaction Time and Visual Cue
Demographic Questionnaire

1) Are you (circle one) **MALE** **FEMALE** **OTHER**

2) AGE: _____ Years old.

3) Do you have any visual impairments? **YES** **NO** **OTHER**

If **YES**, please explain:

4) On average, how many hours a day do you spend playing video games (This includes apps on your phone like Candy Crush Saga and Song Pop)? _____ Hours

Appendix C

Reaction Time and Visual Cues

Reaction Time Chart:

Reaction Test Order:	Average Before Video:	Average After Video:	Difference In Averages:	Notes:
1. 2.				
1. 2.				
1. 2.				
1. 2.				
1. 2.				
1. 2.				
1. 2.				

Appendix D

Stoplight Reaction Time Game

Instructions:

1. Click the large button on the right to begin.
2. Wait for the stoplight to turn green.
3. When the stoplight turns green, click the large button quickly!
4. Click the large button again to continue to the next trial.
5. Repeat the steps until you have completed 5 trials.
6. Let the instructor know when you are finished so they can write down your average time.

Full Screen Reaction Time Game

Instructions:

The screen will start out blue.

1. Click anywhere on the screen to begin and the screen will turn red.
2. Once the screen turns green quickly click anywhere on the screen.
3. The screen will turn blue again in between trials so you will need to click again to begin the next trial.
4. Repeat the steps until you have completed 5 trials.
5. Let the instructor know when you are finished so they can write down your average time.

Appendix E

Feedback letter

Thank you for participating in my research study. The study was conducted in order to determine whether visual cues would impact your reaction time. There were two different conditions in the study. The first condition required the participant to complete the reaction time games and watch a video that had an increased speed. The other condition was exactly the same but instead of the video speed increased, the video speed was decreased. I hypothesized that the participants who watched a video with two times the normal speed would have a faster average for their reaction time when completing the reaction time games.

Please remember, I am not interested in your individual results; I am only interested in the overall findings based on aggregate data. No information about you will be associated with any of the findings, nor will anyone be able to trace your responses on an individual basis.
If you are interested in obtaining the final results of this study based on aggregate data, or if you have any questions or concerns regarding any portion of this research study, please feel free to let me know now, or in the future. My contact information is found at the bottom of this page.

Thank you again for your valuable contribution to this study.

Sincerely,

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Appendix F

Reaction Time and Visual Cues

Reaction Time Chart:

Reaction Test Order:	Average Before Video:	Average After Video:	Difference In Averages:	Notes:
1. Stoplight Test 2. Full Screen Test	261ms	317ms	-56ms	Fast speed x1.5
1. Full Screen Test 2. Stoplight Test	381ms	262ms	+119ms	Slow speed x0.5
1. Full Screen Test 2. Stoplight Test	311ms	386ms	-75ms	Fast speed x1.5
1. Stoplight Test 2. Full Screen Test	465ms	486ms	-21ms	Slow speed x0.5
1. Stoplight Test 2. Full Screen Test	405ms	449ms	-44ms	Fast speed x1.5
1. Full Screen Test 2. Stoplight Test	432ms	327ms	+105ms	Slow speed x0.5
1. Full Screen Test 2. Stoplight Test	322ms	297ms	+25ms	Fast speed x1.5

1. Stoplight Test 2. Full Screen Test	276ms	422ms	-146ms	Slow speed x0.5
1. Stoplight Test 2. Full Screen Test	575ms	364ms	+211ms	Fast speed x1.5
1. Full Screen Test 2. Stoplight Test	537ms	466ms	+71	Slow speed x0.5
1. Full Screen Test 2. Stoplight Test	406ms	318ms	+88ms	Fast speed x1.5
1. Stoplight Test 2. Full Screen Test	285ms	278ms	+7ms	Slow speed x0.5
1. Stoplight Test 2. Full Screen Test	471ms	526ms	-55ms	Fast speed x1.5
1. Full Screen Test 2. Stoplight Test	610ms	468ms	+142ms	Slow speed x0.5