MISINFORMATION ABOUT THE MISINFORMATION EFFECT

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This study partially replicated the research of Cook, Kwak, Hoffman, & Loftus where they examined post-event activities that induces subjects to pick a wrong person in a forced choice identification procedure. The goal was to investigate if providing a neither option to a match to sample task increases the accuracy of responding. Subjects were asked to study three faces for 10 seconds, after which they were asked to pick out the faces in a forced choice setting where two other faces were presented. Later the subjects were asked to pick out faces in a setting in which they could use a neither option. Results indicated that a generalization effect occurs when identifying faces and the effect is seen as subjects choosing the wrong face. This suggests that when using faces with some similar features in a lineup setting the procedure may cause the subject to pick the wrong person.
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INTRODUCTION

Eyewitness accounts are used in many situations to establish facts about environmental stimuli. Our court systems convict individuals for crimes using eyewitness accounts. Insurance companies regularly rely on eyewitness accounts for information about accidents and police investigations are often directed by eyewitness accounts. However, the reliability of eyewitness accounts has been called into question and been made the subjects of many research studies. Nonetheless eyewitness testimony is frequently used to establish identification, perhaps because a better tool has not yet been developed.

The Innocence Project has reported

Over 230 people serving an average of 12 years in prison have been exonerated through DNA testing in the United States and 75% of those wrongful convictions (179 individual cases) involved eyewitness misidentification. In half of the misidentification cases the eyewitness testimony was the central evidence used against the defendant (Grisham, 2009, p. 3).

“The Innocence Project is a national litigation and public policy organization dedicated to exonerating wrongfully convicted individuals through DNA testing and reforming the criminal justice system to prevent future injustice” (Grisham, 2011).

In a lineup setting there are many factors that influence the responses of the eyewitness. Wells and Loftus (2003) mention some factors that may influence accuracy of identification such as the way a question is worded, the degree of similarity among the people in the lineup, the initial description and whether the witness has seen pictures of the alleged criminal. In recent years many efforts have been made to decrease the influence of variables such as a reduction of unscripted
conversation during the procedure and the standardization of the presentation of pictures. Even with the recent procedural improvements, accuracy of performance on the lineup task is still not sufficient.

Cook, Kwak, Hoffman and Loftus (2009) conducted an experiment where they investigated if postevent activities would affect a subject’s ability to accurately identify the right person in a lineup setting. Their study was done in three phases: a study phase, a quiz phase and a test phase. During the study phase, three pictures of faces were presented individually, projected on a screen in front of the subjects. During the quiz phase the subjects had to identify the picture of the faces from two comparisons; subjects were asked to indicate the correct picture by writing L (left) or R (right) on a piece of paper. The first set of comparisons contained one picture that was shown in the study face and one that had not been shown in the study phase. The second set of comparisons contained one face that resembled the picture shown in the study phase and one that had not been shown in the study phase. The third set of comparisons contained a picture that had been shown in the study phase and a picture shown in the quiz phase. Subjects often picked one of the faces shown in the quiz phase. Cook et al. (2009) did misinform their subjects during their experiment.

Cook et al. (2009) concluded that:

Postevent activity that induces subjects to pick a wrong person affects later ability to accurately identify the right person. Committing to the postevent information produces larger effect, but mere exposure without choosing also impairs final memory performance. (p. 26)

The phenomenon is known as the misinformation effect and has been extensively investigated by several studies (Lindsay, Allen, Chan & Dahl, 2004; Loftus, 1975; Loftus & Palmer, 1974; Marche, Brainred, & Reyna, 2010; Mitchell &
Zaragoza, 1996; Wright & Loftus, 1998). The misinformation effect refers to instances in which memory for an event changes as a result of post-event information. Explanations for the effect appeal to inferred processes such as selective memory, selective failure to remember, false memories for things not actually witnessed or experienced, and hindsight biases that all can be factors in creating a misinformation effect (Zhu, Chen, Loftus, Lin, He, Chen, Li and Moyzis, 2010; Davis and Loftus, 2007; Cook, Kwak, Hoffman and Loftus (2009)). Lindsay, 1990; Lindsay, Allen 2004; Mitchell & Johnson, 2000 investigated source monitoring, that is information integrated through semantic memory and Challies, Hunt, Garry and Harper, (2011) suggests that the misinformation effect is equivalence relations.

The purpose of this study was to investigate the effects of a neither response option on the accuracy of a face identification task used to study the misinformation effect. Most research, if not all, has been done using forced choice matching procedures. Rosales-Ruiz, Pasley and Potucek (1992) tested delayed matching-to-sample (MTS). They investigated competing control by certain comparison stimuli or positions. The study examined an identity sorting task that had some features in common with the standard MTS procedure. They used three boxes in a discrimination sorting task where one box was used as “different”. Comparing the task with a sorting task where there was no option to sort as “different”. Rosales-Ruiz, Pasley and Potucek (1992) found that stimulus control inferred from forced choice matching tasks does not hold in tasks where there is a response option that indicates that the stimuli does not match the sample. Thus, there is a possibility that the misinformation effect is not produced by postevent activities directly experienced by the witness before identification or indirectly through semantic memory or equivalence relations,
rather the effect is directly produced by forcing subjects to choose among stimuli during the identification task. This research replicates Cook et al. (2009) with the addition of a neither response option and some manipulations of the post event activity. To study the effects of the postevent activity three types of postevents were used. 1) The sample stimulus was presented along with a face that had no similar facial features to the sample; 2) two comparisons that had no similar facial features to the sample; and 3) two comparisons one that had some of the same facial features as the sample along with another comparison that had no similar features to the sample.
METHODS

Subjects

A total of 23 students enrolled in undergraduate classes at UNT participated in this study. The subjects were composed of a diverse ethnical and social background and reflect a broad sample of the population who might be asked to identify people’s faces in a police lineup. The subjects were given an informed consent form according to the Institutional Review Board guidelines (IRB). Participation in the experiment was voluntary and subjects could choose not to participate without consequence to their grade or performance in class.

Setting

The experiment was conducted in a classroom at the University of North Texas (UNT). The room contained about 50 chairs with tables for student seating, a desk, a presentation screen and a projector.

Materials

Experimental stimuli were presented to the students using a powerpoint presentation projected on the screen. A total of 18 different pictures of faces were used as stimuli. The stimuli were pictures of faces provided by Cook (2005). Six pictures were used as sample stimuli and presented as alleged criminals and 12 pictures were used as decoys. The stimuli were divided into two sets. Set 1 contained three faces of alleged criminals and six decoys. Set 2 contained three faces of alleged criminals and six decoys. The stimuli presented is included as frames in Appendix C.
PROCEDURE

Procedures for All Groups

The experimenter introduced himself to the class and asked for permission to conduct a study. The subjects were given the informed consent form and the forms in which they made their responses (See Appendix A & B). The experimenter read the informed consent form to the subjects and asked if they had any questions regarding it. Once all the questions were answered, subjects were asked to record their age and ethnicity on the form. The experimenter began the powerpoint presentation which was projected on a display in the front of the classroom. The powerpoint presentation consisted of four phases: a Study phase, a Quiz phase and two test phases. During the Study Phase three pictures of alleged criminals were presented individually for 10 seconds. During the Quiz, Test 1 and Test 2 phases the subjects were asked to identify the alleged criminal from two comparisons. There were three types of comparison stimuli presented in the phases: 1) The sample was presented with a decoy that shared features with the sample, shared features means that the sample had similar outline of the head or face. 2) Two decoys that did not share features with the sample were presented. 3) A decoy that shared features with the sample was presented with a decoy that did not share features with the sample (See Appendix C and Table 1).

Forced Choice Condition

Study Phase

Slide 1: “Study the pictures carefully. You will be asked to pick them out later. These are alleged criminals. You will have 10 seconds with each picture.”

The experimenter read the directions on the slide and informed the subjects
that the three faces would come in rapid order and that they should study the faces carefully. The experimenter asked if there were any questions before the experiment started, no questions were asked and the experimenter started the presentation of the faces. Pictures 1-3 were shown individually for 10 seconds.

Quiz Phase

After the study phase the subjects were told that they would be presented with two comparison faces and to pick out the alleged criminal. The subjects were asked to indicate their response by marking an A or B box on the form (See Appendix B) they had been given. Slide 6 had the following instructions:

“Mark the correct picture with A or B on your sheet of paper.”

Subjects were also instructed to raise their hand to indicate that they had made a choice. Slide 7 showed the first comparisons for Picture 1. After 10 seconds of the presentation the experimenter asked, “Is anyone not done?” If no one indicated a response the next comparisons was shown. The maximum time allotted for each picture was 30 seconds; this was not needed for any trial. This instruction was repeated for all comparison pictures. Slide 8 showed the second comparisons for Picture 2 and Slide 9 showed the third and last comparisons for Picture 3.

Test 1

During the Test 1 phase, the instructions for the Quiz phase were repeated to the subjects. The subjects were shown two comparison pictures and were asked to indicate their answer by marking the box A or B on their sheet of paper. This was repeated for all three comparisons.

Test 2

During the Test 2 phase subjects were presented with the pictures shown in
Test phase 1. The difference was that this time subjects were allowed to emit a “neither” response alternative. The slide had the following instruction.

“Mark the correct picture with A, B or Neither on your sheet of paper.”

Appendix D shows the sample and comparisons used for Set 1.

After the forced choice condition was completed with picture Set 1, the neither condition was tested with picture Set 2 (See below), which was immediately followed by a re-presentation of picture Set 1 in the neither condition.

Neither Condition

In the neither condition the instructions from the forced choice section were repeated with the following differences: In the Quiz and Test phases the subjects were told that they would be presented with two comparison faces and directed to pick out the alleged criminal and indicate their response by marking an A, B or Neither box on the form (See appendix B) they had been given. Slide 22: Had the following instructions.

“Mark the correct picture with A, B or Neither on your sheet of paper.”

The second difference was in the Test 2 phase, they could now only indicate A or B, as they had in the forced choice conditions. The slide had the following instruction.

“Mark the correct picture with A or B on your sheet of paper.”

Picture Set 2 was re-presented in the forced choice condition after the second presentation of Picture Set 1. Appendix C shows the sample and comparisons used for Set 2.
DESIGN

The design used was a reversal of the two different conditions, the forced choice (A) and neither condition (B). The sequence of conditions for stimulus Set 1 was ABA and the sequence for Set 2 was BAB. The effects of A and B were replicated across three pictures per set. Tables 1 and 2 represent the manipulations made in the experiment for Picture Sets 1 and 2, respectively. See Appendices D and E to see the order of pictures used in the experiment.

Table 1

Manipulations Made in the Experiment, Picture Set 1

<table>
<thead>
<tr>
<th>First Exposure</th>
<th>Study Phase</th>
<th>Quiz phase</th>
<th>Test 1</th>
<th>Test 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Forc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>choice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture 1</td>
<td>D, S</td>
<td>D, F-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture 2</td>
<td>D, D</td>
<td>D, D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture 3</td>
<td>F-, D</td>
<td>F-, S</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second exposure</th>
<th>Study Phase</th>
<th>Quiz phase</th>
<th>Test 1</th>
<th>Test 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Forc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>choice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture 1</td>
<td>D, S</td>
<td>D, F-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture 2</td>
<td>D, D</td>
<td>D, D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture 3</td>
<td>F-, D</td>
<td>F-, S</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Code: D = Dissimilar, S = Sample, F- = Face different, O- = Outline different
Table 2

*Manipulations Made in the Experiment, Picture Set 2*

<table>
<thead>
<tr>
<th>Study Phase</th>
<th>Quiz phase</th>
<th>Test 1</th>
<th>Test 2</th>
</tr>
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<tr>
<td></td>
<td>Neither</td>
<td>Neither</td>
<td>Forced choice</td>
</tr>
<tr>
<td>Picture 1</td>
<td>D, S</td>
<td></td>
<td>O-, D</td>
</tr>
<tr>
<td>Picture 2</td>
<td>D, D</td>
<td></td>
<td>D, D</td>
</tr>
<tr>
<td>Picture 3</td>
<td>D, O-</td>
<td></td>
<td>O-, S</td>
</tr>
</tbody>
</table>

**Second exposure**

<table>
<thead>
<tr>
<th>Study Phase</th>
<th>Quiz phase</th>
<th>Test 1</th>
<th>Test 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Forced choice</td>
<td>Forced choice</td>
<td>Neither</td>
</tr>
<tr>
<td>Picture 1</td>
<td>D, S</td>
<td></td>
<td>O-, D</td>
</tr>
<tr>
<td>Picture 2</td>
<td>D, D</td>
<td></td>
<td>D, D</td>
</tr>
<tr>
<td>Picture 3</td>
<td>D, O-</td>
<td></td>
<td>O-, S</td>
</tr>
</tbody>
</table>

Code: D= Dissimilar, S = Sample, F- = Face different, O- = Outline different
RESULTS

Forced Choice Condition First (Picture Set 1)

The figures show the cumulative responses of Group 1 ($n = 23$) for the first exposure to Picture Set 1 during the forced choice and neither condition. The pictures in the graph represent the pictures used in the experiment. The first picture is the sample and the remaining comparison pictures that are different from the sample is designated as False Positive 1 (Fp1) and False Positive 2 (Fp2). Fp1 is defined as the first picture shown that is not the sample picture and Fp2 is defined as the first picture shown that is not the sample picture. The reason for this is to clearly identify the pictures selected by the subjects.

Figure 1 (top) shows the cumulative responses during the forced choice and neither conditions for Picture 1, Set 1. The first panel shows that during the quiz, 23 of 23 subjects correctly selected the comparison that matched the sample. The second panel shows that during Test 1, 9 subjects selected Fp1, 12 subjects selected Fp2 and 2 subjects did not indicate an answer. The third panel shows that during Test 2, which included the neither response option, two subjects selected Fp1, 13 subjects selected Fp2, and 8 subjects correctly rejected both comparisons in the neither condition.

Figure 1 (bottom) shows the cumulative responses during the second neither and forced choice conditions for Picture 1, Set 1. The first panel shows that, during the quiz, 23 of 23 subjects selected the correct comparison in the neither condition. The second panel shows that during Test 1, 1 subject selected Fp1, 10 subjects selected Fp2 and 12 subjects correctly rejected the comparisons in the neither
condition. The third panel shows that during Test 2, in the forced choice condition 3 subjects selected Fp1 and 19 selected Fp2. 1 subject did not indicate a response.

Figure 2 (top) shows the cumulative responses during the first forced choice and neither conditions for Picture 2, Set 1. The first panel shows that, 7 subjects selected Fp1 and 14 subjects selected Fp2 during the quiz. The second panel shows that 3 subjects selected Fp1 and 18 subjects selected Fp2 during Test 1. The third panel shows that in the neither condition, 2 subjects selected Fp1, 11 subjects selected Fp2 and 10 subjects correctly rejected the comparisons during Test 2.

Figure 2 (bottom) shows the cumulative responses during the second neither and forced choice conditions for Picture 2, Set 1. The first panel shows that 2 subjects selected Fp2 and 21 subjects correctly rejected the comparisons during the quiz. The second panel shows that 4 subjects selected Fp2 and 19 subjects correctly rejected the comparisons during Test 1. The third panel shows that in the forced choice condition 4 subjects selected Fp1, 17 subjects selected Fp2 and 2 subjects did not indicate a response during Test 2.

Figure 3 (top) shows the cumulative responses during the first forced and neither conditions for Picture 3, Set 1. The first panel shows that 21 subjects selected Fp1 and 1 subject selected Fp2 during the quiz. 1 subject did not indicate a response. The second panel shows that 7 subjects selected Fp1 and 16 subjects selected the correct comparison during Test 1. The third panel shows that in the neither condition 9 subjects selected Fp1, 12 subjects selected the correct comparison and 2 subjects incorrectly rejected the correct comparison (miss) during Test 2.

Figure 3 (bottom) shows the cumulative responses during the second neither and forced choice conditions for Picture 3, Set 1. The first panel shows that 9 subjects
selected Fp1 and 14 subjects correctly rejected the comparisons during the quiz. The second panel shows that 3 subjects selected Fp1, 19 subjects selected the correct comparison and 1 subject incorrectly rejected the comparisons (Miss) during Test 1. The third panel shows that 3 subjects selected Fp1 and 20 subjects correctly selected the correct comparison during the forced choice condition presented in Test 2.

Neither Choice Condition First (Picture Set 2)

Figure 4 (top) shows the cumulative responses during the first neither and forced choice conditions for Picture 1, Set 2. The first panel shows that 23 subjects selected the correct comparison stimuli during the quiz. The second panel shows that 1 subject selected Fp1, 2 subjects selected Fp2 and 20 subjects correctly rejected all the comparisons during Test 1. The third panel shows that 12 subjects selected Fp1, 8 subjects selected Fp2 and 3 subjects did not indicate a response during the forced choice condition presented in Test 2.

Figure 4 (bottom) shows the cumulative responses during the second forced choice and neither conditions for Picture 1, Set 2. The first panel shows that 22 subjects selected the correct comparison and one subject selected Fp1 during the quiz. The second panel shows that 7 subjects selected Fp1, 13 subjects selected Fp2 and 3 subjects did not indicate a response during the forced choice presented in Test 1. The third panel shows that 2 subjects selected Fp1, 6 subjects selected Fp2 and 15 subjects correctly rejected the comparisons when the neither condition was presented again in Test 2.

Figure 5 (top) shows the cumulative responses during the first neither and forced choice conditions for Picture 2, Set 2. The first panel shows that 1 subject selected Fp1, 1 subject selected Fp2 and 21 subjects correctly rejected the
comparisons during the quiz. The second panel shows that 1 subject selected Fp1, 10 subjects selected Fp2 and 12 subjects correctly rejected the comparisons during Test 1. The third panel shows that 2 subjects selected Fp1, 19 subjects selected Fp2 and 2 subjects did not indicate a response during the forced choice presented in Test 2.

Figure 5 (bottom) shows the cumulative responses during the second forced choice and neither conditions for Picture 2, Set 2. The first panel shows that 4 subjects selected Fp1, 16 subjects selected Fp2 and 3 subjects did not indicate a response during the quiz. The second panel shows that 5 subjects selected Fp1, 15 subjects selected Fp2 and 3 subjects did not indicate a response during Test 1. The third panel shows that 4 subjects selected Fp1, 4 subjects selected Fp2 and 15 subjects correctly rejected the comparisons during the neither condition presented in Test 2.

Figure 6 (top) shows the cumulative responses during the first neither and forced choice conditions for Picture 3, Set 2. The first panel shows that 8 subjects selected Fp2 and 15 subjects correctly rejected the comparisons during the quiz. The second panel shows that 3 subjects selected Fp2, 4 subjects incorrectly rejected the comparisons and 16 subjects selected the correct comparison during Test 1. The third panel shows that 4 subjects selected Fp2 and 19 subjects selected the correct comparison during the forced condition presented in Test 2.

Figure 6 (bottom) shows the cumulative responses during the second forced choice and neither conditions for Picture 3, Set 2. The first panel shows that 21 subjects selected Fp2 and 2 subjects did not indicate a response during the quiz. The second panel shows that 1 subject selected Fp2 and 22 subjected selected the correct comparison during Test 1. The third panel shows that 1 subject selected Fp2 and 22 selected the correct comparison during the neither condition presented in Test 2.
DISCUSSION

The present study investigated the effects of a neither response option on the misinformation effect reported by Wells and Loftus (2003) and many others (e.g., Guinther & Dougher, 2010; Cook et al., 2009; Zhu, Chen, Loftus, Lin, He, Chen, Li & Moyzis, 2010; Davis & Loftus, 2007). The results show that the neither option reduces false positive responses and responses based on exclusion or S-control (See, Carrigan & Sidman, 1992; Tomonaga, 1993). The effect is independent of the postevent misinformation provided. When there was no misinformation during the postevent manipulation in the quiz, that is when the correct comparison was presented as one of the choices, all subjects correctly identified the face presented in the study phase during the Forced choice and Neither conditions. When there was feature misinformation during the quiz, that is when the correct comparison was replaced with a face that shared some of the same features but was different than the sample, all subjects chose the picture with shared features in the forced choice condition, however, the majority of the subjects correctly rejected the comparisons during the neither condition. Functionally, these subjects were not misinformed. When the comparisons had no features in common during the quiz, most subjects chose one of the comparisons, perhaps on the basis of some of face features (e.g., type of hair of Set 2, picture 2). However, in the neither condition all the subjects correctly rejected the comparison except for two subjects. In this case all but two subjects were not misinformed.

During testing, when one of the comparisons shared features with the sample and the other did not, subjects’ responses were distributed among the alternatives
during the forced choice condition. During the neither condition about half of the subjects correctly rejected the comparisons and the other half continued to pick the comparison that was similar to the sample. Interestingly the subjects that correctly rejected the comparisons were the subjects that chose the comparison that was not similar to the sample. The performance of these subjects suggests that they were not responding on the basis of the sample (S+ control) but on the basis of the other comparison (S- control) during the forced choice test. This result also suggests that half of the subjects were under the control of the hairdo and facial outline and the other half under the control of the central facial features. Control by fewer features than the total features of the stimulus complex is known in the literature as stimulus overselectivity (Lovaas, Schreibman, Koegel, & Rehm, 1971). With respect to faces, for example, Duarte and Baer (1997) showed stimulus overselectivity in face recognition by removing the hairdo of their stimuli. Subjects were less likely to recognize the face without the hairdo. These results have implications for the notion of misinformation. It seems that during the study face all what is learned is a restrictive set of facial features. If the features manipulated (e.g., hairdo) during the misinformation phase are the ones controlling the subjects responding, the subjects are likely to discriminate the decoy, if the subjects are controlled by other features than the ones manipulated, the subjects would continue choosing the decoy, since functionally nothing has changed for them. In this sense they are not misinformed, that is, noting has changed in the stimulus control of behavior. The feature manipulated is not a defining property of the stimuli class (see, Skinner, 1935). Interestingly in the second exposure when the neither choice was introduced first in Set 2 most of the subjects correctly rejected the comparisons except for two.
During testing when the two comparisons did not share features with the sample, subjects’ responses were allocated mainly to one of the comparisons, however, when the neither option was introduced most subjects correctly rejected the comparisons. The only exception was when the neither response option was introduced after the forced choice. Then half of the subjects correctly rejected the comparisons and the other half continued to choose one of the comparisons. In Set 2 when the neither choice was presented first all the subjects, except for one, correctly rejected the comparisons. However, in the following neither condition half of the subjects choose the previously selected false positive. This was likely to a similar feature that the false positive shared with the sample.

During testing when the comparisons included a face similar to the sample and the correct face, the majority of the subjects chose the correct comparison and the other subjects chose the other comparison. However, by the end of the first exposure subjects were equally likely to choose either comparison. During this condition none of the subjects chose the neither-response option. These results replicate Cook et al. (2009), however, it is not clear if this is an effect of misinformation or simply generalization. During the misinformation phase (quiz) of the second exposure, when the similar face replaced the correct comparison, the majority of the subjects correctly rejected the comparisons; only eight of them selected the comparison that was similar. This suggests that effect is one of feature generalization rather than misinformation (see Palmer, 1991). Cook et al. (2009) speak of this as a postevent activity that induces the subject to pick the wrong person and that committing to the response increases the effect and impairs final memory performance.
The misinformation effect is explained in several ways, factors such as selective memory, selective failure to remember, false memories for things not actually witnessed or experienced, hindsight biases, postevent viewings (Wells and Loftus, 2003; Zhu et al. 2010; Davis & Loftus, 2007; Cook et al. 2009) and stimulus equivalence (Challies, Hunt, Garry and Harper 2011) are invoked to account for the misidentification of eyewitnesses. The results of the present study suggest that the misinformation effect is an artifact of the testing condition coupled with generalization. However, the results also support Cook et al. (2009) conclusion that post event activity may change face identification. This is effect is seen in the results of this study in two ways: 1) repeated presentation of false comparisons in the forced choice condition increases selections to a certain comparisons overtime; and 2) repeated presentation of forced choice can change the selection of stimuli from correctly rejected to false positive. The effects are similar to what the carryover effect described by Barlow, Nock & Hersen (2009) as “the lingering effect of one treatment phase to a subsequent phase” (p. 91). However, it is not the exposure to a sketch or picture itself that is the cause of inaccurate responding but rather how it was tested that can strengthen or weaken responses toward one stimuli. Overall it seems that continued exposure to comparisons during the forced choice test decreased accuracy and continued exposure during the neither condition increased accuracy. It is believed that misinformation provided after the event influences the accuracy of identification. Wells and Loftus (2003) mention several factors that influence eyewitness accuracy, factors mentioned are:

Witness characteristics (e.g., Sex, intelligence), characteristics of the witnessed event (e.g., exposure duration, presence of a weapon), post event variables (e.g., suggestions from other witnesses, exposure to a sketch),
characteristics of the identification task (e.g., structure of the lineup, instructions to witnesses prior to viewing the lineup), and post identification events (e.g., feedback to eyewitnesses regarding the identification). (Wells & Loftus, 2003, p. 156)

Our results do not support the claim that the mere exposure to a sketch or picture affects the accuracy. Results show similar responding across the different types of misinformation provided. For example in figure 1 (top) & figure 3 (top), subjects predominantly selected the comparison that had similar features as the sample. The continued responding to these false positives could be explained by that subjects are looking at some features of the stimuli and not the whole stimuli. This suggests that the subjects were generalizing, generalization is a common thing in our daily life. Keller & Schoenfeld (1950) says it best.

A little thought will convince you that this principle is of importance to any organism in its daily life. Our environment is in perpetual flux, and it is very unlikely that any stimulus ever recurs in identical form. The visual stimuli supplied by a running rabbit to a pursuing fox, or by the face of a friend as you see it from moment to moment, are subject to countless variations in pattern, movement, brightness, and so forth, yet the fox continues its chase, and you do not feel yourself confronted by a procession of strangers. In the ever changing environment, the generalization of stimuli gives stability and consistency to our behavior. (p. 116)

When identifying a stimulus we look at certain features of that stimulus, not all the features, so when you take out or replace certain features you may still identify it as the same, if this is done slowly and more and more features are taken out you can change the subjects responses toward that stimulus. In this experiment we found that generalization is the main cause of misidentification and that when not given an option to reject comparisons this effect is enhanced and you select out other features that you normally identify by. We also see that the generalization effect is reduced in identification tasks in which a neither choice is given to the subjects.
Another account of the misinformation effect is the one provided by Challies, Hunt, Garry and Harper (2011). In their view equivalence relations (e.g., Sidman and Tailby, 1982) in the form of contextual confusion between classes of stimuli pertaining to the target event, including those formed subsequently, may allow the false recognition of elements associated with the target event by emergent relations. Thus the production of false memories are seen as a “by-product of stimulus equivalence and emergent relations” (p. 358). However, their results can also be accounted by their forced choice testing and feature generalization. As shown by Rosales et al. (1992) apparent identity control does not allow us under one set of circumstances to confidently assume that comparable identity relations will be evident under different circumstances.

While the police go to great lengths to ensure an objective and accurate identification process it may still influence the subject. Precautions such as blind testing, many comparisons in the lineup, similar features in the pictures and in the live lineup are among those precautions taken to ensure accurate identification. Imagine the following scenario. You have witnessed a crime and had a few moments to study the subject, you are then asked to come and give a description of the subject and a drawing is made based upon what you have described. You are shown the drawing and agree or disagree that that resembles the subject. After which you are shown a collection of pictures. You are here informed that the subject may not be in the pictures. The pictures of the individuals shown have the same major features of what you observed, a lineup of pictures if you will. You are informed that the subject may not look exactly like what you saw. You find a picture that looks like the one you saw and point that out and are asked, is this the subject? You respond with yes that looks
like the subject. Further inquiry on certainty is made and after the subject is brought inn you are asked to come and make a visual identification in a lineup. Again you are set in a lineup setting were you are asked to pick out the subject with a new lineup of faces. You point out the one that you saw and indicate that as your answer. But who are you picking out? The one you gave a description of? The one you saw in the picture lineup? Someone you saw at the time of the crime scene? Or are you identifying the subject? And to add to the problem, if you originally saw a person with a beard and you are later asked to identify the person but the beard is shaved off and you are looking at the person in a different setting. Are you then identifying the same that you saw?

We suggest that the police prior to exposing their eyewitnesses to any lineup procedure first give their eyewitnesses a test like the one used in this experiment to teach the subjects the importance of accurate identification and informing them on the importance to use a neither option. The way we would suggest this is done is by first letting the subjects do the test and then explaining the test’s function to them. This would be a form of rejection training that may reduce the frequency of wrongly identified subjects in police investigations.
CONCLUSION

A tentative conclusion can be made, in that giving a neither option from the start in a choice situation decreases false positives and reduces the “false memories” in subjects. And that a forced choice condition enhances responding to one stimulus and can affect future responding toward the comparison that was used. The very positive thing that this brings with it is that if you are trying to expand a stimulus class then this is a good teaching method, which would be similar to that or an errorless (reduced) teaching method (See, Etzel, 1997). It’s also concluded that the subjects did not discriminate between all the features in the faces and that when presented with similar faces a generalization effect occurs. For future studies it is recommended to study what specific features individuals are looking at. It is also recommended to increase the number of stimuli and repeated testing of a smaller selection of individuals. It is also desirable to add an additional test phase to see if further use of forced choice would increase the responding to one sample to the point of exclusive responding.
Figure 1. Forced choice condition first and neither condition second.
Figure 2. Forced choice condition first and neither condition second.
First exposure

Second exposure

Figure 3. Forced choice condition first and neither condition second.
Figure 4. Neither condition first and forced choice condition second.
Figure 5. Neither condition first and forced choice condition second.
Figure 6. Neither condition first and forced choice condition second.
APPENDIX A

INFORMED CONSENT
Title of Study: Are we testing for stimulus control or creating new stimulus control?

Principal Investigator: Jesús Rosales-Ruiz. University of North Texas (UNT) Department of Applied Behavior Analysis.

Student Investigator: Lars Halvorsen. University of North Texas (UNT) Department of Applied Behavior Analysis.

Purpose of the Study: You are being asked to participate in a research study which involves how we as humans are able to retain information when presented with complex pictures. We seek to learn how these effects can be affected by factors such as time, options and complexity.

Study Procedures: You will be asked to study some pictures and later attempt to recognize those pictures when presented to you again and indicate which is the correct one, the process will take about 5 to 10 minutes of your time.

Foreseeable Risks: There are no foreseeable risks involved in this study.

Benefits to the Subjects or Others: This study is not expected to be of any direct benefit to you, however it may yield important information about factors that influence your perception of visual stimuli. This is especially important in court systems and fields in which teaching is involved. We hope that by doing this we may start to gain a greater understanding of how visual stimuli affects us and how we respond to it. This study may benefit the field of behavior analysis, specifically pertaining to the literature of stimulus control.

Procedures for Maintaining Confidentiality of Research Records: The confidentiality of your individual information will be maintained in any publications or presentations regarding this study. The information gathered through the questionnaires and informed consent will be kept separate in a locked box. Only the Principal Investigator and Student Investigator. will have access to the data containing personal information. All identifying markers will be removed from the publications so that you cannot be identified. No personal information can be obtained unless both consent form and questionnaire are obtained. The identifying marker will be a number which will be at the top of the questionnaire form which correlates to the consent form. The data will be kept until it is no longer valid or a minimum of 3 years. At that
point the Principal Investigator and Student Investigator. may destroy the documents by shredding and/or burning.

**Questions about the Study:** If you have any questions about the study, you may contact *Lars Halvorsen* at telephone number Authors phone number or at email: *Authors email*.

**Review for the Protection of Participants:** This research study has been reviewed and approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at (940) 565-3940 with any questions regarding the rights of research subjects.

**Research Participants’ Rights:**

Your signature below indicates that you have read or have had read to you all of the above and that you confirm all of the following:

- *Lars Halvorsen* has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
- You understand that you do not have to take part in this study, and your refusal to participate or your decision to withdraw will involve no penalty or loss of rights or benefits. The study personnel may choose to stop your participation at any time.
- Your decision whether to participate or to withdraw from the study will have no effect on your grade or standing in this course.
- You understand why the study is being conducted and how it will be performed.
- You understand your rights as a research participant and you voluntarily consent to participate in this study.
- You have been told you will receive a copy of this form.

________________________  ______________________________
Printed Name of Participant  Signature of Participant
Date_________________

**For the Principal Investigator or Designee:**

I certify that I have reviewed the contents of this form with the subject signing above. I have explained the possible benefits and the potential risks and/or discomforts of the study. It is my opinion that the participant understood the explanation.

____________________________________  __________
Signature of Principal Investigator or Designee  Date
APPENDIX B

DATA GATHERING SHEET
Master thesis study by Lars Halvorsen. University of North Texas (UNT) student.

Department of Behavior analysis.

Personal information

Experiment number: ____________

Age: ___ Ethnicity: ____________

Indicate answers with A or B. (A corresponds with the picture to the left and B corresponds to the picture on the right)

A     B

A     B

A     B
Indicate answers with A, B or Neither. (A corresponds with the picture to the left and B corresponds to the picture on the right, if the picture is not there your response is Neither)
APPENDIX C

PICTURES USED AND THE ORDER OF PRESENTATION
The order in which the pictures were presented in the corresponding phase for Picture Set 1. All pictures in the study phase were presented, then all comparisons in the Quiz phase presented, all pictures in Test 1 were presented and lastly all pictures in Test 2 were presented.
The order in which the pictures were presented in the corresponding phase for Picture Set 2. All pictures in the study phase were presented, then all comparisons in the Quiz phase presented, all pictures in Test 1 were presented and lastly all pictures in Test 2 were presented.
Table C1

*Manipulations in the Experiment (Both Sets)*

The codes below are representations of the pictures used in the study. D = Dissimilar to the sample, this picture has no similarities to the sample. F- = The face has no similarities to the sample. O- = The outline (Hair, ears) is not similar to the sample. S = The sample picture presented.

<table>
<thead>
<tr>
<th>Picture Set 1</th>
<th>First Exposure</th>
</tr>
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<tbody>
<tr>
<td>Study Phase</td>
<td>Quiz phase</td>
</tr>
<tr>
<td></td>
<td>Forced Choice</td>
</tr>
<tr>
<td>Picture 1</td>
<td>D, S</td>
</tr>
<tr>
<td>Picture 2</td>
<td>D, D</td>
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<td>Picture 3</td>
<td>F-, D</td>
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<table>
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<td>Study Phase</td>
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<td>Forced choice</td>
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<tr>
<td>Picture 1</td>
<td>D, S</td>
</tr>
<tr>
<td>Picture 2</td>
<td>D, D</td>
</tr>
<tr>
<td>Picture 3</td>
<td>D, O-</td>
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</table>

<table>
<thead>
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</tr>
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<td>Picture 3</td>
<td>D, O-</td>
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REFERENCES


