

Earwitness Identification: An Examination of Scenario, Lineup Type and Gender *as factors* in Identification Accuracy

by

Taylor Smith

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APPROVED/APPROUVÉ

Thesis Examiners/Examineurs de thèse:

Dr. Paul M. Valliant
(Supervisor/Directeur de thèse)

Dr. Paul Dupuis
(Committee member/Membre du comité)

Dr. Annie Roy-Chalrand
(Committee member/Membre du comité)

Studies
supérieures

Dr. Stuart McKelvie
(External Examiner/Examineur externe)

Approved for the Faculty of Graduate

Approuvé pour la Faculté des études

Dr. David Lesbarrères
Monsieur David Lesbarrères
Dean, Faculty of Graduate Studies
Doyen, Faculté des études supérieures

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Abstract

The current study was conducted examining the effects of scenario type, lineup type and target gender in regard to earwitness identification accuracy. Two hundred and forty participants listened to one of the three possible scenarios (criminal, neutral, controversial), and were asked to identify either a male or a female perpetrator. Participants completed the State Trait Anxiety Inventory during the retention interval, which lasted roughly five minutes. Afterwards they were asked to identify either the male or female voice from a five-voice lineup. Voice lineups were presented either simultaneously or sequentially. Participants were less accurate at identifying the male voice compared to the female voice in both present and absent lineups. Participants were also more accurate at identifying the target voice in the present simultaneous condition compared to the sequential condition. All other conditions were found to be non-significant. These findings help advance the field and understand the variables such as lineup, gender and scenario.

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Earwitness Identification: An Examination of Scenario, Lineup Type and Gender *as factors* in Identification Accuracy

Within law enforcement and legal organizations, reliable identification of criminals has been proven difficult (Wells & Olson, 2003). One strategy within the process of conviction of criminals is the use of alternative resources. For instance, citizens have been recruited by law enforcement to provide evidence in identifying the individual responsible for a crime (Technical Working Group for Eyewitness Evidence & United States of America, 1999). In the past, eyewitnesses were used as primary sources of criminal identification until DNA analysis was developed and determined more accurate (Brewer & Wells, 2011). Nevertheless, eyewitnesses still remain important components of our justice system and research examining their reliability is crucial (Wells & Bradfield, 1998). Given that many eyewitnesses are used in the court systems and that jurors have a tendency to believe witness testimonies over many other types of evidence, even in light of questionable reliability, this highlights the importance of research on this topic (Hosch, Beck & McIntyre, 1980). The current study seeks to examine the less known earwitness identification accuracy rates and its constituent factors.

Eyewitness Identification

Witnesses can be categorized into three categories: eyewitness, earwitness or an eye and earwitness. Each of these categories has been the object of empirical research to determine the accuracy rate in witness identification (Armstrong & Mckelvie, 1996; Clifford, Rathborn & Bull, 1981; Stevenage, Neil, Barlow, Dyson, Eaton-Brown & Parsons 2013; Wells & Bradfield, 1998; Wells & Olson, 2003; Wells & Turtles, 1987;

Yarmey, 1995; Yarmey, Yarmey & Yarmey, 1994). Eyewitness research has been at the forefront of this field of research (Armstrong & McKelvie, 1996). A possible explanation of this domination of eyewitness research could be the developmental advantages of our visual sense compared to our other senses (Rock & Victor, 1964). Regardless of its importance in research, eyewitness identifications are responsible for more wrongful conviction than other causes combined (Wells & Loftus, 2003; Wells, Small, Penrod, Malpass, Fulero & Brimacombe, 1998). According to Huff et al (1986) wrongful conviction rates are not frequent in United States and England areas. However roughly 60% of the known wrongful convictions are attributed to eyewitness misidentification. Although there are a high number of wrongful convictions, eyewitness identification has not significantly diminished, in part due to the absence of DNA evidence in some crime scenes (Wells & Olson, 2003).

Those in the field of criminal justice want a simple answer to the question of how reliable eyewitness identifications are. However, research in the field reveals that it is complex because eyewitness identification accuracy is dependent on multiple factors (Leach, Cutler & Van Wallendael, 2009; Wells & Turtle, 1987). For example, police instructions when presenting a witness with a lineup are one of the many conditions that can affect accuracy rates. There are only two types of instructions that law enforcement officers can use biased or unbiased. Witnesses are often told that the police believe the culprit is in the lineup and one must choose the person they saw commit the crime, which would be biased instructions. This is in contrast to unbiased instructions stating the perpetrator may or may not be in the lineup (Malpass & Devine, 1981). Buckhout et al. (1975) found that participants' confidence levels were higher when identifying a

perpetrator when they were given biased instructions compared to the unbiased instructions. Within this area, a “best choice” strategy can be used; the “best choice” strategy refers to a technique that witnesses use when identifying a target. This strategy requires that the witness compares all the suspects and chooses the one that “best fits” the target from the crime. This strategy often occurs when witnesses are uninformed that the culprit may not be present within the lineup and therefore they assume the culprit is present and feel the need to choose a suspect (Malpass & Devine, 1981; Wells & Turtle, 1987). Even though some witnesses may realize that the perpetrator is not within the lineup, they are still identifying a lineup member whom they believe most resembles the perpetrator (Wells, 1984). This may occur when law enforcements instructions are biased and there is pressure on the witness to make identification.

To adjust for the high false identification rates, lineup type has also been examined. In a review by Wells and Turtle (1987) they explain a traditional lineup as all lineup members being presented simultaneously, which may be why a “best choice” strategy is arising in research studies. . By exposing witnesses to all possible suspects at once, witnesses may be comparing all individual suspects to their specific memory of the perpetrator therefore using relative judgment. Therefore leading one to choose the suspect whom they believe to be most similar to the target (Wells & Turtle, 1987). Police departments use simultaneous lineups to present the suspects alongside the foils, which allow the witness to examine and compare all the suspects presented. Wells and Turtle’s (1987) however also reviewed studies that examined an alternative lineup that can be used to eliminate the “best choice” strategy called a sequential lineup. A study by Lindsay and Wells (1985) in particular found that a sequential lineup produced fewer

false identification rates in target absent lineups compared to the traditional target present simultaneous lineup (Lindsay & Wells, 1985). Sequential lineup allows witnesses to examine and accept/reject a suspect or foil before the next suspect or foil is presented using absolute judgment. By determining that the “best choice” strategy occurs during a simultaneous lineup, law enforcement can use sequential lineups, to decrease the “best choice” strategy. By using a sequential lineup, fewer false identification can be made in an absent lineup condition compared to the traditional simultaneous conditions without the reduction of accurate identification.

As proposed in the examples presented above, eyewitness identification accuracy can be more accurate under certain conditions and less under others. By understanding the faults in eyewitness identification, jurors and members of the criminal justice system can make educated decisions based on the factors the witness experienced during the crime. Though eyewitness identification can be important in court conviction reliability, most witnesses not only visually witness a crime but they also hear and encode this information (McAllister, Dale, Bregman, McCabe & Cotton, 1993).

Eyewitness and Earwitness Identification

In many cases a witness is not only presented with the perpetrator’s voice or face, but commonly witnesses are presented with both (McAllister et al., 1993). McAllister et al. (1993) examined the interference hypothesis. The hypothesis states that auditory information could interfere with the processing of visual information. Visual information was tested by participants’ ability to identify the target face. To test this hypothesis, McAllister et al. (1993) conducted two experiments. For both experiments, participants were told that they were going to listen to a mock crime and then be asked questions

about the crime. There were two conditions; firstly, there was an auditory-visual condition that required participants to listen to the culprit's voice and examine the culprit's pictures simultaneously. The second condition was a visual only condition, in which participants were simply given the picture of the culprit to examine (McAllister et al, 1993). For the first experiment, results revealed there was little auditory interference on visual information. Mean proportions in the audio-visual guilty lineup (.64) condition shows little difference compared to the visual only guilty lineup condition (.75). The hypothesis was confirmed when it was demonstrated that auditory information had little interference with the processing of visual information. Although the hypothesis only described the possible interference of auditory information on visual processing, the second experiment was conducted to understand if visual information would affect the process of auditory information, since it is known that our sight is stronger compared to our auditory sense (Rock & Victor, 1964). The second experiment followed the same procedure but instead of a visual only condition, there was an auditory only condition. The auditory condition was used to compare the accuracy rates of participants in the interference condition (visual and auditory information) to an auditory only condition. In the second experiment, visual information was found to interfere with auditory information identification, which reveals that not only was the hypothesis confirmed, but also that visual information can effect auditory identification.

Armstrong and McKelvie (1996) examined the effect of facial presence on voice recognition. They had participants listen to ten voices read a passage; in the voice only condition, the participants simply heard the voice. For the voice-face condition, they heard the voice, which was accompanied by a face. Participants were tested for voice

recognition; there were two alternative conditions. Throughout the first test condition, participants only heard the voice. During the second condition, participants saw the face along with hearing the voice. Armstrong and McKelvie (1996) found that participants were more accurate when presented and tested with the voice-face condition, but the voice-face condition followed by the voice-only condition did not differ with the voice only conditions when followed by the voice condition.

In another study, Stevenage et al. (2011), placed participants into a visual- only, auditory-only condition or an auditory-visual condition. The auditory-only or visual-only conditions had participants see a face or hear a voice during the study phase prior to the voice or visual recognition tasks. In the auditory-visual condition, participants were presented with a picture of a face accompanied by a voice sample. During the test phase, participants were presented with either a visual recognition or voice recognition task. They needed to identify whether the stimuli was a study face/voice or a distractor face/voice as quickly and as accurately as possible; once this was completed they were asked to rate their confidence. They found that there was significant interference on voice identification if visual information was presented to the participants in the study phase and they were asked to recognize the voice. On the contrary, there was little interference when the voice was presented to participants in the study phase on the visual recognition task (Stevenage et al, 2011). From these results, we are able to see that visual information seems to interfere with the process of auditory information when the visual information is presented during the study phase and tested in voice recognition, whereas auditory information had no interference on visual information processing when a voice sample was presented in the study phase and tested in facial recognition. Stevenage et al., (2011)

results were consistent with McAlister et al., (1993) findings but did differ from the findings of Armstrong and McKelvie (1996).

These studies reveal that when law enforcement officers are acquiring information from witnesses about the vocal features of the criminal, they must be aware that when the visual information (the criminal face) was presented as well, it may have interfered with the processing of the vocal features that the witness previously heard. When law enforcement officers do need auditory information, the optimal situation would be if the witness was an earwitness and not both an eye and earwitness.

Earwitness Identification

Unlike eyewitness identification, fewer research studies have been conducted on earwitness identification. Earwitnesses are able to accurately discriminate a specific voice from a single voice sample or multiple voice samples (Yarmey, 1995). Identification of the speaker is used to test the accuracy of the witness in identifying the target voice as the same voice they heard at the scene of the crime (Yarmey, 1995). Similar to eyewitness identification accuracy, there are factors that affect the accuracy of voice identification such as voice sample duration, retention interval, and target lineup presentation (Yarmey, 1995). Like other social components, all of the factors do not work independently of each other (Yarmey, 1995), which led to inconsistent findings within the literature.

Voice Sample Duration

Voice sample duration refers to the length of time the sample is being played for the participant in an experimental context. The longer the witness is exposed to the criminal voice, the higher the identification accuracy tends to be (Legge, Grosman & Pieper, 1984). It has been deemed by the Supreme Court that the longer the voice sample

duration of the criminal speaking, the higher the accuracy rates will become, but the question still stands regarding the length of time the voice sample become useful (Yarmey & Mathys, 1992). For example Yarmey & Mathys (1992) examined sample durations, said sample durations being eighteen seconds, thirty-six seconds, one hundred and twenty seconds or six minutes. Participants were then presented with a lineup immediately, twenty-four hours, or one week after the initial exposure to the voice (Yarmey & Mathys, 1992). They found that there was an improvement in identification accuracy when the duration of the sample was two minutes to six minutes in length compared to eighteen or thirty-six seconds. Though there seems to be an improvement in accuracy as the voice sample increases, the false alarm rates in the present and absent conditions outweighed the improvement in accuracy. False alarm rates exceeded the accuracy rates in the eighteen, thirty-six and one hundred and twenty second condition. (Yarmey & Mathys, 1992).

Research by Cook and Wilding (1997) examined voice duration. They conducted three experiments that examined length and variety (changing the number of vowel sounds) of the voice sample and familiar vs. unfamiliar voices. In the experiment, once participants were exposed to both the familiar voice test and the unfamiliar voice test (these two conditions were counterbalanced), participants were told to come back one week later when they would then be asked to identify as many words as possible from the voice sample they heard and to identify the voice from a lineup (Cook & Wilding, 1997). In the unfamiliar voice condition, higher identification accuracy was found for the longer sentences. The other two studies found similar results, showing that length of the sample has an important role by increasing identification accuracy (Cook & Wilding, 1997). The

above studies conclude that voice duration length can be crucial to identification accuracy. Witnesses have been found to have a better chance at positively identifying a criminal's voice if the sample duration is longer rather than shorter (Yarmey, 1995). Although it is confirmed by multiple researchers that longer sample duration increase accuracy rates, future studies can use this knowledge to simulate optimal conditions to analyze less known conditions that may affect identification accuracy.

Retention Interval

Even though researchers have found that length of voice duration can increase the accuracy of identifications, the retention interval between the initial sample and the test sample may also be affecting identification accuracy (Clifford, 1980; Clifford et al, 1981; Yarmey, 1995). Retention interval is an important factor to examine when understanding witness identification accuracy because in the court system, the processes are slow. Some court cases could take months or even years before the witness is brought to the court to be cross-examined (Odinot & Wolters, 2006). Knowing how much time can pass between trials or identification, retention intervals are important to evaluate and understand the amount of time that can pass before the identification becomes unreliable (Clifford et al, 1981; Odinot & Wolters, 2006).

Clifford et al. (1981) conducted an experiment with retention intervals of ten minutes, twenty-four hours, seven days and fourteen days. They found a significant difference with retention intervals. The shortest delay period produced the most accurate identification compared to the other interval times (Clifford et al, 1981). Saslove & Yarmey (1980) and Clifford, Rathborn and Bull (1981) expanded on retention interval times by exploring intervals of ten minute ranging to fourteen days. This is not realistic to

a real life application. Since it is unlikely that law enforcement will construct a reliable lineup in a period of three weeks or less (Kerstholt, Jansen, Vans Amelsvoort and Broeders, 2006) it is imperative that longer retention intervals be evaluated. Kerstholt et al. (2006) had participants listen to a voice sample and asked them to identify the voice from a lineup of six voices. The lineup was presented to the participants either three or eight weeks after the initial presentation of the voice sample. They found that there was no decrease in accuracy between three and eight weeks but that there was a high misidentification rate in both conditions. Although they found no difference in accuracy between three and eight weeks, a previous study conducted by Kerstholt et al., (2004) used an interval of one week, which was used in this study for a separate analysis. An examination of a one week retention interval showed an increase of correct identification accuracy in the absent lineup condition when the witness was presented with a longer sample duration. However, there was no significant difference found in the present lineup condition. This implies that participants may become more accurate at rejecting the lineup after a one-week retention interval compared to an immediate test if the target is absent from the lineup. This is consistent with many other studies that have found little to no decline of accuracy after two weeks (Broeders & Rietveld, 1995; Van Wallendael, Surace, Parsons & Brown, 1994).

Target Lineup

As a way of identifying a criminal, law enforcement officers construct a lineup that witnesses examine to try and make a positive identification. In research, having both a target present and target absent lineup helps to simulate conditions of a real life situation. Researchers have confirmed that earwitnesses are more accurate at identifying a

criminal when they are presented within the lineup compared to when the criminal is absent from the lineup (Phillipon, Cherryman, Bull & Vrij, 2007). It is imperative law enforcement officers use strategies in the arrest of perpetrators to increase the accuracy of identifying the criminal. When the criminal is not actually in the lineup but police indicate that a suspect is in the lineup, misidentification is more likely to occur.

Phillipon et al, (2007) asked participants to watch a video and listen to a phone call. Participants had to report to the police the characteristics of the criminal's voice. Once they completed the video and description of the voice, they were asked to answer a questionnaire (retention interval of thirty minutes). During the recognition task, participants were told that the voice may or may not be in the lineup and that they did not need to make an identification (Phillipon, et al, 2007). They found that participants were less accurate in the target absent condition by making more false identifications compared to the target present misses plus false identifications condition (Phillipon et al, 2007; Kersholt et al, 2006). In addition to the above results, participants also had a greater number of correct identification in the target present condition compared to the target absent condition.

Gender Identification

To set up a lineup, law enforcement must find foils that sound similar to the described target voice. This can be a difficult task as not all voices sound the same; some research has been conducted on the ability to recognize a voice based on the characteristics of the voice. Mullennix et al. (2011), found that target voices that were rated as highly typical were confused with other highly typical voices. This could be seen in eyewitness identification because a target voice that is highly typical may get

confused with foil voices that are also highly typical leading to uncertainty of identification. This can be applied to the gender of the target voice as well, meaning that if a male's target voice were rated as highly typical, law enforcement lineup would include foil voices that are also highly typical resulting in more confusion for the witness when trying to identify the target. In eyewitness research this has also been studied. Cross et al. (1971) found that female witnesses not only recognized more faces than male witnesses but also female witnesses recognized male faces less often. This finding shows that a participant's gender may affect the accuracy in being able to identifying a targets face or voice for the purpose of the current study. Wilding and Cook (2000) found that male participants did not significantly differ in their accuracy to identify female and male voices. However female participants were significantly more likely to accurately identify female voices than male voices. These results are similar to Cross et al., (1971), stating that the participants gender could be a variable effecting voice identification.

With minimal research in earwitness identification, the current study will provide optimal conditions for identification by using a short retention interval and longer sample duration. The present study will use optimal conditions as a starting point. To include more realistic conditions, target absent/present lineups will also be used to bring forth the aspect of current law enforcement practice. The current study will also be examining the effect of content and gender difference in lineup identification, along with the effect of simultaneous versus sequential lineup. By examining content of the voice samples, the current study will further understand the impact that content has on identification accuracy within optimal conditions. The purpose of examining target gender is to see if there is a difference in participants' accuracy when asked to identify one gender over the

other. As well, simultaneous/sequential lineup will be examined to expand on the knowledge that is known in the eyewitness literature and see if this holds true for earwitness research as well. The current study is examining these variables on an applied level to understand and help develop better practices around earwitness protocol for law enforcement and the criminal justice system. The overall purpose of the current study is to examine whether or not accuracy will decrease in the optimal conditions for identifications based on the manipulation of the factors that may affect accuracy rates (content, present/absent lineup and simultaneous/sequential lineup).

For each independent variable, a hypothesis was determined. My first hypothesis is that participants will be less accurate at identifying/rejecting a suspect in a controversial and neutral scenario compared to the criminal. This is believed because there is thought to be less urgency in the controversial and neutral scenarios compared to the criminal scenario. Hypothesis two predicts that participants will be less accurate at identifying/rejecting male voices than the female counter part. This is thought to be the case because of the higher probability that there will be more female participants. This is relevant, as it has been shown participants can be more accurate when asked to identify a voice that is the same gender. Hypothesis three predicts that participants will be less accurate at identifying/rejecting the voice in a sequential compared to the simultaneous condition. Hypothesis three is based off the assumption that participants will be less accurate when they are only able to listen to one voice before making a decision and moving on. The fourth hypothesis predicts that participants will be less accurate in the absent condition than the present. This prediction is made based on the findings in many eyewitness identification research, stating that witness are more accurate at identifying a

face within a present lineup condition compared to an absent lineup condition. The last hypothesis predicts an interaction that participants will be less accurate at identifying a voice when presented with the target in a sequential condition compared to a simultaneous condition. This hypothesis is based on the findings in the eyewitness research that show that participants are less accurate at identifying a target when it is presented in a sequential lineup. However it is predicted that participants will be less accurate at correctly rejecting the lineup in an absent simultaneous compared to an absent sequential condition. This prediction was developed on the findings in the eyewitness research that state that participants are more accurate at rejecting the lineup when the target is absent in a sequential lineup.

Methods

Participants

A total of two hundred and thirty-nine participants were recruited from the psychology department at either Laurentian University or Algoma University (Mean age = 23.5, SD = .35; 33 males, 204 females, 2 did not identify). All other participants at Laurentian University/Algoma University were recruited in Introductory Psychology courses or via word of mouth or other disciplines. They received bonus points for their participation. Participants were randomly assigned to each condition and participants were not matched for age or gender in any of the conditions at either university.

Exclusions. Participants who reported impaired hearing and did not have listening/ hearing devices were excluded from this study because it relies strictly on the participant's ability to identify the voice of the target presented by the experimenter.

Materials

Voices. A total of twelve voices were recorded for the purpose of the study. All confederates met the following criteria: all speakers were Caucasian, between the ages of eighteen-fifty and without any speech pathology. All twelve confederates were volunteers found from the community. There were six female confederates and six male confederates for each scenario and lineup type.

Audio Passages. All confederates read lines from three scripts developed for the purpose of this study. One male confederate and female confederate acted as the target speaker or secondary speaker exaggerating their lines, similar to what could be expected of a typical real life situation. The target speaker was always the opposite gender of the secondary speaker for the purpose of this study. As for the other ten confederates, they were used strictly for the voice lineups.

The criminal script involved one confederate portraying a rapist (target speaker), while the other confederate portrayed the victim (secondary speaker). Two versions of this script were made, one with the male as the target speaker and the other with the female as the target speaker. The criminal script included two friends talking about their relationship, which was interrupted when an apparent pseudo “rapist” forces themselves on the other which results in a struggle to get away.

The controversial script involved one confederate portraying a teacher (target speaker), while the other confederate portrayed a student (secondary speaker). Two versions of this script were made, one with the male as the target speaker and the other with the female as the target speaker. This script included the teacher asking for the student’s mother’s maiden name, in which they called them a derogatory name to prove a point about prejudice.

In the criminal script and the controversial script, roles of the confederates were reversed to look at the difference in identification accuracy between male and female voices. In both of these scripts, the participants were asked to identify the target speaker (the one causing the problem) in the criminal script (the rapist), and in the controversial script, where the target speaker was the teacher.

The neutral script involved both confederates acting as a married couple. There were two versions of this script created. The “husband lines” were used as the target lines and played both by the female and the male confederates based on lineup type. There were two scripts to keep it consistent with the other two conditions, as well as keeping the target lines the same for each target gender lineup condition. This script included a married couple having a discussion on finances and their future together as a couple. The lines were gender neutral, so they could easily be read by either gender. They were labeled the “husband lines” as it was a male in the original script that spoke them.

All confederates were needed for the development of the lineup in which participants identified the target (the voice the experimenter asked the participants to identify). Each confederate was given all the target lines to read from each script for the lineup; in total thirty-six lineup passages were created, meaning that each lineup suspect read all the same lines as the target from the clip to keep the scenarios consistent. Confederates were asked not to exaggerate any of the target lines and to speak in a monotone voice.

Equipment. All voices were recorded on the Zoom H4N (Zoom corporation, Japan) and transferred to a MacBook Pro (13-inch, Mid 2010). The recordings were opened and played on Quick Time Player (version 10.3 copyright 2009-2013 Apple Inc.).

Algoma University. Participants listened to the audio clip and 5-voice lineup via headphones (Klipsch/Mode M40).

Laurentian University. Participants listened to the audio clip and 5-voice lineup via headphones (Arion Legacy/ Deep Sonar 2).

Questionnaire. The State-Trait Anxiety Inventory (STAI) was used to measure participants' state and trait anxiety levels after listening to the audio recording. This questionnaire was used as the delay period and was not being scored. Participants were required to fill out a socio-demographic questionnaire that contained novel items such as age, gender, discipline and primary language.

Procedure

Participants were tested individually in a sound proof booth in Cognitive Health Science Laboratory at Laurentian University or a sound proof room at Algoma University. There were twenty-four possible conditions the participant could have been placed in. Participants were placed into a scenario condition (criminal, controversial or neutral), trying to identify the target voice (male or female) in a lineup (sequential or simultaneous) with the target voice being present or absent within the lineup.

Each participant listened to one audio clip (criminal, controversial or neutral), which was only played once. All recordings included one male and female speaking for approximately one and a half minutes. Before the participants listened to the audio clip, they were told to listen to as much detail as possible as they would need to answer questions about it later (instructions were intentional). Once the audio clip was completed, they were presented with the STAI questionnaire. This acted as the delay period between witnessing the scene and being presented with the lineup. After the

questionnaire was completed, participants were presented with a five-voice lineup (each voice clip was roughly one minute long), in which they identified the target speaker (male or female) as requested by the experimenter based in the condition. Each individual lineup voice was only played once for the participant. Participants were told they would be presented with a simultaneous lineup or a sequential lineup. Simultaneous lineups were presented by having the participant listen to all five voices before making a decision, whereas the sequential lineup involved participants listening to one voice and making a decision before moving to the next voice. During each condition, the lineup order was randomized, along with the position of the target voice during the lineup present conditions. Participants' responses to the voice lineup was recorded by them circling "yes" for this is the target speaker or "no" for this is not the target speaker. They were told before listening to the lineup that there was a possibility that the target voice may or may not be within the lineup.

Results

Scoring

Each response was categorized in each condition as correct or incorrect, for the present condition participants either correctly identified/rejected the lineup or they incorrectly chose a foil/rejected the lineup. For the absent condition participants either correctly rejected the lineup or incorrectly identified a foil.

Regression Analysis

A binominal logistic regression was completed with each independent variable. The parameter estimates show that scenario was not a significant predictor of accuracy ($1, \beta = -.02, p > 0.05$). Target lineup type was also found not to be a significant predictor

of accuracy ($1, \beta = .30, p > 0.05$). Lastly, lineup type was not found to be a significant predictor of accuracy ($1, \beta = .16, p > 0.05$). The only variable to be a significant predictor of accuracy was the gender of the lineup ($1, \beta = -.77, p < 0.05$) confirming the second hypothesis.

Gender and Age Effects

The gender and age of the participants was recorded to enable an examination of these variables. Although participant's age was non-significant in all conditions, it was matched across each condition. In addition the majority of participants ($N = 212$) were 30 years of age and under, while a small minority of participants ($N = 26$) were 31 years of age or above. The small number of male participants did not allow for valid statistical analysis of participant gender. Please refer to table 1 to view the gender distribution across conditions.

Chi-square

A series of chi-square analyses were conducted to examine the relationship between categorical independent variables and accuracy. For accuracy all Chi-square analyses used the variable "Decision Type" as their criterion meaning correct identification in the present lineup and correct rejection in the absent versus incorrect in each case. Decision type was defined as the participant's decision to state that the target was present/absence in the current line up. An expected count of less than five was used unless otherwise stated.

Chi-Square for Decision Type. A chi-square was used to examine scenario types by decision type. No significant affect of scenario type was found $\chi^2 (2, N = 239) = 1.31, p = .52, V = .07$. This means that the type of scenario did not seem to effect

participants ability to correct/incorrectly identify the target voice whether male/female, present/absent or tested with a simultaneous/sequential lineup (refer to Table 2).

A chi-square was performed to examine target lineup type by decision type. No significant affect of target lineup type was found $\chi^2 (1, N = 239) = 1.21, p = .27, V = .07$. This shows that decision type (accuracy) did not differ between present and absent lineups (refer to Table 3).

A chi-square was run to examine lineup type by decision type. No significant effect of lineup type was found $X^2 (1, N= 239) = .34, p= .56, V= .04$. This finding shows that participant's accuracy was not affected by whether the lineup was simultaneous or sequential (refer to Table 4).

A chi-square was conducted to examine gender of the lineup by decision type ($\chi^2 (1, N = 239) = 8.49, p = .004, V = .19$). It was found that participants were less accurate (50) than expected (61.3) at correctly identifying the male target voice. Where as in the female condition participants were more accurate (72) than expected (60.7) at correctly identifying the target voice. This result shows that overall other condition participants were less likely to identifying a male target voice correctly and more likely to identify a female target voice correctly (refer to Table 5).

Present. A chi-square was performed to examine lineup type by present lineup correct identifications $\chi^2 (1, N = 239) = 4.52, p = .03, V = .19$. In the simultaneous condition, participants were more likely (38) than expected (32.2) to correctly identify the target in the present lineup. Participants had fewer incorrect identifications/misses (21) than expected (26.8) in the present simultaneous condition. In the sequential lineup condition, the opposite pattern occurred; participants were less likely to make a correct

identification (27) than expected (32.8) and more likely to make incorrect identifications/misses (33) than expected (27.2). See Table 6 for observed count.

Absent. When a chi-square was run for lineup type and absent lineup decision, there was no significant values found $\chi^2(1, N = 239) = 1.64, p = .20, V = .12$. See Table 7 for observed count. A report of data in all condition can be found in table 9-15, no analyses were conducted in this report.

Overall accuracy of earwitness participants was 51%, meaning that witnesses in the current were just a bit more accurate than chance. Other studies in the earwitness field have found conflicting results. Yarmey et al (1994) found a 38% accuracy rate over all condition when examining voice lineup vs. voice show ups with the target present or absent. Kersholt et al. (2006) found different overall accuracy rates for both present and absent conditions. Participants had a 28% accuracy rate in the absent lineup conditions, compared to 24% in the present lineup conditions. Cook and Wilding (1997) found that participants had 76% accuracy when identify male or female voices depending on the witness gender. As seen from the studies above, the findings in the earwitness field vary depending on the variables being tested. Leading to the conclusion that more research needs to be conducted within this field to better understand earwitnesses overall accuracy rate.

Discussion

The purpose of the current study was to examine if listeners' accuracy in identifying a target in a lineup or rejecting the lineup with no target would decrease from optimal conditions (minimal delay and longer sample duration) based on the manipulation of content in the scenario (criminal, controversial or neutral), the gender of

the target they were asked to identify, and the type of lineup they were presented with (simultaneous or sequential). For this study, I hypothesized that participants were going to be less accurate at identifying/rejecting a target voice when they listened to the criminal scenario compared to the other two scenarios. I hypothesized that participants would be less accurate at identifying/rejecting the male target voice compared to the female counterpart. Thirdly I hypothesized that participants would be less accurate at identifying/rejecting a voice in the sequential lineup compared to the simultaneous. As well as that participants would be less accurate at identifying/rejecting a voice in an absent condition than when the voice was present. Lastly, I hypothesized that there would be an interaction to show participants would be less accurate at identifying the target voice when it was presented in a sequential lineup.

Hypothesis one was not confirmed as there was no main effect found for scenario type. It can be stated in this study that the type of scenario the participants were presented with did not affect accuracy in identifying or rejecting the target voice.

Hypothesis two confirmed that male target voices were identified/rejected less accurately than the female target voices. I believe this to be the case due to the own-sex effect particularly for the female voices. This finding could also be explained by the participant's gender. Cross et al. (1971) found that female witnesses recognized more faces than male witnesses; moreover, female faces were more recognized over male faces. Although in this study neither the gender of the witness nor gender of target faces were significant main effects, it helps to further explain the gender differences found in the current study. Specifically, Cross et al. (1971) showed that female witnesses recognized male faces less often, but recognized female faces more often. This finding

can also be seen in the current study result which indicates that female voices were more recognizable than male voices due to the larger sample of female (204) witnesses in the current sample compared to the male sample (33). Lastly, this effect could have been found due to the possible limitation of the female target voice being atypical versus typical compared to the other female voices presented. Mullennix et al. (2011), found that original highly typical voices were confused with highly typical foils. This may explain why witnesses were less accurate at identifying the male voice, as it was a typical voice and thus was similar to the other typical male foil voices in the lineup, resulting in more confusion for the witnesses when trying to identify the male target voice and creating an uncertainty surrounding their decision. The female voice may have been determined atypical to the typical female foil voices in the lineup resulting in a more accurate identification rate than the male lineup (Mullennix, Ross, Smith, Kuykendall, Conrad & Barb, 2011), resulting in witnesses' ability to notice a considerable difference between the female target voice and the other female voices, which allowed them to correctly identify the female target more accurately than in the male target condition.

The third hypothesis was not confirmed. Participant's had no difference in accuracy between sequential and simultaneous conditions.

The fourth hypothesis was not confirmed that participants were less accurate in the absent condition compared to the present condition over all conditions. Meaning that participants were more accurate at identifying the target voice when it was present within the lineup.

The fifth hypothesis, an interaction between lineup type and target lineup type was partially confirmed. Participants showed no difference in accuracy between

simultaneous and sequential lineup in the absent condition. However, participants were less accurate at identifying the target voice when the target was present in a sequential lineup. This finding parallels with that of the eyewitness research, where it was found that correct identifications are more likely in a simultaneous lineup when the target's face is present (Stebly, Dysart, Fulero & Lindsay, 2001). Steblay et al. (2001) found that roughly 50% of their sample was more accurate in the present simultaneous condition compared to the 35% of the sample accuracy in the sequential condition. Lindsay and Wells (1985), found that when it came to target present lineups, similar correct identifications were made in both the simultaneous (.58) and sequential lineups (.50) even though there was a slight increase of correct identifications made in the simultaneous condition. They explained that this could be due to the decrease of false identifications made in the sequential lineup (.02) compared to the higher number of false identifications made in the simultaneous lineup (.12).

The current study contributes significantly to the field in numerous ways. While previous work has explored jurors perception on eyewitness accuracy (Wells, Lindsay, & Ferguson, 1979), length of recall retention interval (Boydell & Read, 2011; Clifford, Rathborn & Bull, 1981; Kersholt, Jansen, Van Amelsvoort & Broeders, 2006; Odinet & Wolters, 2006; Kersholt, Jansen, Van Amelsvoot & Broeders, 2004; Van Wallendael, Surace, Hall Parsons, & Brown, 1994; Yarmey, 1995), target presence (Philippon, Cherryman, Bull & Vrij, 2007; Yarmey, Yarmey & Yarmey, 1994), tone of voice (Read & Craik, 1995; Saslove & Yarmey, 1980; Yarmey & Matthys, 1992), face effects on voice recognition (Armstrong & Mckelvie, 1996; Cook & Wilding, 2001; McAllister, Dale, Bregman, McCabe & Cotton, 1993; Stevenage, Howland & Tipplet, 2011), voice

sample duration (Cook & Wilding, 1997; Kersholt, Jansen, Van Amelsvoot & Broeders, 2004; Yarmey, 1995; Yarmey & Matthys, 1992), and lineup type (Yarmey, Yarmey, Yarmey, 1994), this study contributes to the field by examining the effect of content of the scenario. More precisely, I examined the ability to identify the target when it was presented in either a criminal, controversial or a neutral scenario. This study also examined the comparison between male and female lineups. There is a lack of research using female voice lineup. Although multiple studies only use male lineups (Boydell & Read, 2011, Kersholt et al., 2004, Read & Craik, 1995), research using female lineups focused on other features (Armstrong & Mckelvie, 1996, Stevenage et al, 2011), which leaves a gap in the understanding of participants' accuracy in identifying female voices. Finally, to the best of our knowledge, this study was the first in earwitness research to examine the difference of participants' accuracy when presented with a simultaneous versus a sequential lineup. First to be discussed will be the basic effect or findings of earwitness literature contributing to the development of this study. Second, I will discuss the contribution this study has made to earwitness research, followed by the reasoning behind the importance of this study. Earwitness research has many variables that can be examined or remain constant throughout a study.

In order to assure that the current study's manipulations were valid, I used common effects in the earwitness literature. In earwitness research, many variables have been examined such as retention interval, voice sample duration and target presence. Clifford et al. (1981) found the shortest delay produced the best performance compared to all the other conditions. In experiment two, they examined longer retention intervals but found a similar effect, which displayed that the shortest interval of ten minutes was

significantly better than all other retention interval conditions (Clifford et al, 1981). Based on these findings, a short retention interval of ten minutes was used in the current study. In a review by Yarmey (1995), voice sample duration was examined, and it was explained that the longer a witness' opportunity to listen to the target, the higher the probability of accurate identification. Yarmey and Mathys (1992) examined voice sample durations and found that longer sample duration led to a significantly larger number of hits. Based on these previous findings, each target voice used in the current study was presented for forty-five seconds each; the full clip was roughly a minute and a half. Although the voice clips were not overly lengthy, the full time of the clip allowed for enough exposure to understand the circumstances of the scenario. Not only are retention interval and voice sample duration important in the accuracy of identification, but the presence of the target voice can affect the accuracy of identification as well. When examining target presence, Phillippon et al. (2007), found that when witnesses were presented with a target absent lineup, more incorrect voices were chosen when the language was unfamiliar. Also, understanding that the police are not always accurate at apprehending the correct suspect is important to take into consideration when examining earwitness or eyewitness accuracy. In this study, a present and absent lineup condition was created to examine the effect presence of the target voice has on accuracy rates when combined with the other variables listed above such as retention interval and sample duration. With these constant variables set, the current study was able to examine earwitness identification accuracy regarding message content and male and female voices when presented in simultaneous or sequential lineup.

Implications

The findings of this study demonstrate that witnesses are less accurate at identifying a male voice in a lineup when the male voice is present and absent. This finding has serious implications in the way our justice system works. Before the use of DNA analysis, witnesses were used as a primary source of evidence. Regardless, witnesses still remain important within our justice system (Brewer & Wells, 2011; Wells & Bradfield, 1998). With the findings from this study, it can be determined that a significant amount of weight should not be put on witness testimonies as it can lead to false identification or missed identification (Sherrin, 2014; Wells & Bradfield, 1998), especially if the individual is male and the lineup is sequential. For example, many innocent people (false identifications) are convicted due to the use of witnesses. From the literature, it appears jurors put less emphasis on the witnesses after an expert explains the accuracy rates of witness research (Hosch, Beck & McIntyre, 1980).

The specific implications of my results presented would indicate that law enforcement officers should be more cautious when using witness testimonies when the witness is identifying a male target. When dealing with witness testimonies for male targets, it is suggested that police ensure their instructions are clear and precise on the option the witness has (reject the lineup or choose a target). It also appears that female voice was more accurately identified in the present lineup condition. This could be due to the limitation in the female lineup because the voice ranges between each female confederate was different, leading to possible easier detection of the female target voice when presented. Although this finding may be do to a limitation, if there is a “real” gender difference this could change the procedures as to how law enforcement proceeds with the process in which witnesses take to identify a female suspect. This finding can

also be applied to the justice system when having witnesses as part of a criminal case by understanding the limitations that witnesses have on recall of a voice in male compared to female lineups (Sherrin, 2014). Recommending that the justice system use multiple sources of evidence, as well as assessing the variables that could affect the reliability of the witness testimony are reproduced (Sherrin, 2014).

Along with understanding that there is a difference between identification of male and female voices, there is a difference in accuracy when presented with different lineup types (simultaneous versus sequential). While this is a well documented effect in eyewitness research, showing that when a witness is presented with a present simultaneous condition, they were more accurate at identifying the target face (Stebly, Dysart, Fulero & Lindsay. 2001), to the best of our knowledge this is the first systematic study to explore this question in earwitness research. This result is crucial in the research because it is showing that similar procedures can be used for both eye and earwitnesses by law enforcement due to the accuracy of identification. It was thought that with eyewitnesses both simultaneous and sequential lineups could be used, simultaneous leading to more accurate identification when the target was present, but sequential leading to more identification when the target was absent. Although in this study there was no significant effect of sequential vs. simultaneous lineup in the absent condition, earwitnesses mimicked part of this pattern regarding simultaneous and sequential in the present condition. This indicates that earwitness and eyewitness maybe impacted similarly by the lineup differences. Therefore more specific research focusing on earwitnesses using either simultaneous or sequential lineups may help clarify this question. By adding more information regarding male, female voices and lineup types,

the justice system, including police officers, lawyers and judges can start to understand the difference of witness accuracy when identifying the voice of certain genders as well as the type of lineup that should be used based on the confidence of the suspect in custody.

Limitations and Strengths

Some limitations of the current study include having a wide variety of female voices in the presented lineup, participants were exposed to only one scenario type and only small sample size was used. As well, too many independent variables were tested simultaneously. The current study also included an uneven amount of male and female participants. As a result of the voluntary recruitment of the confederates of both genders, the female and male lineup were created by using the most similar voices identified by the experimenter, which did lead to a variety of voice ranges in the female lineup. Also because of the large design, each condition consisted of only ten participants; in the future it would be suggested to increase group sizes to increase power. A potential limitation of study could have occurred based on a spelling error. The word “wop” was misspelled in the scenario scripts “whop”. If the confederates would have known the real spelling of the word this may have caused confusion for the confederates when reading the script. Lastly, a post-experimental check may have been beneficial to find out if participants perceived each scenario presented in terms of criminality or inappropriateness or derogatory for the word “wop”. With the addition of a post-experimental check the study would have been strengthened. However, some strengths of the current study were that it was a true experiment and the twenty-four conditions were matched for each University, for age and gender of the participant.

Future Research

Based on the results found, future research should examine solely female lineups that are in a similar voice range. Since it was found that witnesses were more accurate at identifying female voices, it would be important to control the variation in female voices by altering one female voice to five other female voices by changing each voice by a few octaves. By controlling voice variation, it could be discovered whether witnesses are truly more accurate at identifying female voices or if it was due to the wide variation in the female voices. As well, more research can be conducted on lineup types since the findings show that witnesses were more accurate at identifying voices in the present simultaneous condition. Future researchers should examine the order of the target voice in present condition in both simultaneous and sequential lineups to examine if the positioning of the target voice is affecting the accuracy of the witness. It would also be interesting to examine the results of the use of same gender voices for the script.”

Conclusion

Overall this study presents important findings that showed that witnesses were more accurate at identifying the voice in a present simultaneous condition. This is similar to that of eyewitness identification but had never been examined before in earwitness research to my knowledge. In effect, it is important to show that witnesses tend to be more accurate when identifying the target voice in the present simultaneous condition and that witnesses are more accurate at identifying a female voice in a presented condition than a male voice. With these results, we can conduct more research to reach a greatest understanding and develop the processes needed to determine accuracy of both

earwitnesses and eyewitnesses in the field. Furthering our research will advance the understanding of witness accuracy and the impact of variables such as gender and lineup types within the justice system.

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Tables

Table 1. Gender of participants in all Conditions

Male/ Female	Scenario Type	Present/ Absent	Simultaneous/ Sequential	Gender of Participants	N
Male	Criminal	Present	Simultaneous	Female	10
			Sequential	Female	10
			Total	Female	10
		Absent	Simultaneous	Male Female	1 9
			Sequential	Female	10
			Total	Male Female	1 19
	Controversial	Present	Simultaneous	Male Female	1 9
			Sequential	Male Female	2 8
			Total	Male Female	3 17
		Absent	Simultaneous	Male Female	1 9
			Sequential	Male Female	1 9
			Total	Male Female	2 18
Neutral	Present	Simultaneous	Male	2	
			Female	7	
		Sequential	Male	4	
			Female	6	
Total	Male Female	6 13			

		Absent	Simultaneous	Male	2
				Female	8
			Sequential	Male	5
				Female	5
			Total	Male	7
				Female	13
Female	Criminal	Present	Simultaneous	Female	9
			Sequential	Female	10
			Total	Female	19
		Absent	Simultaneous	Male	1
				Female	9
			Sequential	Female	10
			Total	Male	1
				Female	19
	Controversial	Present	Simultaneous	Male	2
				Female	8
			Sequential	Female	9
			Total	Male	2
				Female	17
		Absent	Simultaneous	Male	2
				Female	8
			Sequential	Male	1
				Female	9
			Total	Male	3
				Female	17

Neutral	Present	Simultaneous	Female	10
			Male	2
		Sequential	Female	8
			Male	2
		Total	Female	18
			Male	2
	Absent	Simultaneous	Male	4
			Female	6
		Sequential	Male	2
			Female	8
		Total	Male	6
			Female	14

Table 2. Observed Count for Scenario Type * Correct/Incorrect Identification

Scenario Type		Correct Identification	Incorrect Identification	Total
Criminal	Count	38	41	79
Controversial	Count	45	35	80
Neutral	Count	39	41	80
Total	Count	122	117	239

Table 3. Observed Count for Target Lineup Type * Correct/Incorrect Identification

			Correct Identification	Incorrect Identification	Total
Target Lineup Type	Present	Count	65	54	119
	Absent	Count	57	63	120
Total		Count	122	117	239

Table 4. Observed Count for Lineup Type * Correct/Incorrect Identification

			Correct Identification	Incorrect Identification	Total
Lineup Type	Simultaneous	Count	63	56	119
	Sequential	Count	59	61	120
Total		Count	122	117	239

Table 5. Observed Count for Gender of Lineup * Correct/Incorrect Identification

			Correct Identification	Incorrect Identification	Total
Gender of Lineup	Male	Count	50	70	120
	Female	Count	72	47	120
Total		Count	122	117	239

Table 6. Observed Count for Lineup Type * Present Crosstabulations

			Present		Total
			Correct Identification	Incorrect Identification	
Lineup Type	Simultaneous	Count	38	21	59
	Sequential	Count	27	33	60
Total		Count	65	54	119

Table 7. Observed Count for Lineup Type * Absent Crosstabulations

				Absent		Total
				Correct Rejection	False Identification	
Lineup Type	Simultaneous	Count	25	35	60	
	Sequential	Count	32	28	60	
Total		Count	57	63	120	

Appendix A

Scenario Full Scripts; Read by the confederates

Criminal Scenario Script 326 Words and 1 minute and 20 seconds

Marcus (Target): Look at this place

Emily (Secondary): Yea

Marcus: It's amazing, I got a job, great place, great friends.

Silence for 3 seconds

Marcus: Howl (like a wolf)

Both: laugh quietly

Marcus: Come on, Come on, Come on howl with me!

Marcus: (howls again) come on

Emily: (howls weakly)

Marcus: Dude, that was terrible.

Emily: What I'm not one for the howling

Marcus: oh no, maybe you just need to be woken up (picks her up and spins her)

Emily: wow ok (mumbles this)

Both: out of breath, breathing heavy

Emily: Woah (hits him lightly)

Marcus: Hey, you know when I am with you I feel like I can do anything, I have never felt that way before.

Emily: (Sigh) That's sweet

Marcus: You know were not so different you and me.

Emily: Hey, you know I think, maybe it time to go (Marcus cuts her off)

Marcus: wai,, wait, (now pulling her in close to him)

Emily: (softly) Marcus

Marcus: Come on, Come on, I see the way you look at me. No one has ever been this nice to me.

Emily: Yea, Cause you Peter's brother (said forcefully)

Marcus: No, it is more than that, you know it, I know it. I get it you don't want to hurt him, but he wouldn't have to know.

Emily: Marcus (more forceful)

Struggle is beginning (he is holding her tight)

Marcus: wait, what am I not good enough?

Emily: No I don't mean it like that, ok let go

Marcus: Peter gets all the fun, the good life, huh right! (Tries to kiss her)

Emily: (struggling underneath him now on the ground) Get off of me (whiny voice)

Marcus: Come on, Come on, one night no one needs to know.

Emily: Get off me, please (whining)

Struggling back and forth to try and get herself free from underneath him until she hit him over the head.

Marcus: Ow!

Struggles, he has her leg and she gets away

Controversial Scenario Script
243 Words and 1 minute and 12 seconds

George (Target): My lesson today is when people treat other people badly because of their skin colour or religion or where they come from, really smart, really cool people can really suffer.

- 11 seconds of silence and background noise

George: Hey, Emily before your mother got married what was her name again?

Emily (Secondary): Cordini

George: Cordini, so that would make you a whop right?

Emily: What did you call me? (very angry)

George: You heard what I called you, what are you going to do about it? (forcefully)

Emily: I'm going to knock your head off (pushing him against the wall)

George: What if you couldn't? What if you couldn't do anything about it?

Emily: What?

George: What if you lived in a country where I could kill you because of you moms last name?

Emily: George, what are you talking about?

George: A fifteen year old girl (shouting) is dead (sigh) doesn't any body care?

Emily: George (soft voice)

George: She was real smart and totally cool, she wrote this book. Her name was Anne Frank, they said she died of typhus, but they killed her because her name was Anne Frank. Anne Frank was a victim of anti-Semitism, you have to read this book and you have to pass this test, not because of me but because when someone calls someone else a bad name its not good that just that one person jumps up. We all have to jump up.

Neutral Scenario Script –
290 Words and 1 minute and 10 seconds

Emily (Secondary): I've been thinking, it is not fair for me to ask you to spend all of your money on our wedding. I mean you work really hard for that, well you work for that.

Mark (Target): Look I've thought about it to I'm sorry. I think we should spend all the money on the wedding.

Emily: You do?

Mark: Yea, I'm putting my foot down. Yeah, I love you, when I proposed I told you I would do anything to make you happy and if having the perfect wedding makes you happy than that's what we're going to do.

Emily: You're so sweet

- they hug

Emily: Aww but wait, what about the future and stuff?

Mark: Ah, forget about the future and stuff, so we only have two kids. We will pick our favorite and that one will go to college.

Emily: Wow, you've thought about that?

Mark: Yea

Emily: How many kids were we going to have?

Mark: 4, 1 boy, twin girls and another boy

Emily: What else do you think about?

Mark: Well, stuff like where we'd live, you now like a small place outside the city. Where our kids can learn to ride their bikes and stuff. You know we could have a cat that had a bell on its collar that we could hear every time it ran through the kitty door. Of course we would have an apartment above the garage where Stewart can grow old.

Emily: You know what? I don't want a big fancy wedding.

Mark: Sure you do. (Emily cuts him off)

Emily: No, I want everything you just said, I want a marriage.

Mark: You sure?

Emily: mmmhuh

Mark: I love you so much

Emily: I love you too