

WITNESS MEMORY: THE EFFECTS OF ACCENT AND THREAT

CONTENT ON VISUAL AND AUDITORY MEMORY

FOR A PERPETRATOR

A THESIS

SUBMITTED TO THE GRADUATE SCHOOL

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE

MASTER OF COGNITIVE AND SOCIAL PROCESSES

BY

JOSHUA B. STALLER

DR. KERRI PICKEL

BALL STATE UNIVERSITY

MUNCIE, INDIANA

JULY 2010

ABSTRACT

THESIS: Witness Memory: The Effects of Accent and Threat Content on Visual and Auditory Memory for a Perpetrator

STUDENT: Joshua B. Staller

DEGREE: Master of Cognitive and Social Processes

COLLEGE: Science and Humanities

DATE: July, 2010

PAGES: 37

Based on the multiple resource model, a more difficult auditory task should use more attentional resources and leave fewer resources to attend to visual information. Research suggests that trying to listen to and understand a speaker with an accent is difficult. In addition, stimuli that are considered threatening can raise stress levels and reduce the amount of attentional resources available. In the present study, participants watched one of four videos that portrayed a bank robber delivering a statement with either a Midwestern or Serbian accent and with either high or low level of threat. For the perpetrator's appearance, participants provided significantly more correct and fewer incorrect details if they heard the Midwestern accent or the low threat statement. These results support the multiple resource model and suggest that further research is needed with the model in eyewitness memory.

Witness Memory: The Effects of Accent and Threat

Content on Visual and Auditory Memory for a Perpetrator

When a person witnesses a crime, he or she becomes an eyewitness who will be asked to describe and/or identify the perpetrator. The eyewitness usually begins by identifying or describing what the perpetrator looked like. Based on certain personal and situational factors, the eyewitness is able to complete either task with varying levels of accuracy (Pickel, 2007; Wells, Memon, & Penrod, 2006). Past research has considered such situational factors as lighting conditions, exposure duration, and weapon focus. Research has also investigated the effects of personal factors such as the age and ethnicity of both the perpetrator and the eyewitness. In addition, a number of studies have considered the methods used to question eyewitnesses about the perpetrator (Pickel, 2007; Wells et al., 2006). Researchers have considered factors involved in photo and live lineups, as well as factors that affect the descriptions that eyewitnesses provide.

However, relatively little research has considered whether auditory factors could affect visual memory. According to the multiple resource model of attention (Wickens, 2008), difficult auditory tasks can interfere with performance on a visual task. Because perpetrators may speak or give orders during a crime, it is possible that the auditory message could interfere with visual memory. Pickel (2009) investigated this possibility by considering whether a perpetrator's foreign accent or especially complex message content can interfere with visual memory. The current study is meant to replicate and extend that research by using a different accent and manipulating threat content rather than message content complexity. This study will also use a different actor, scenario, and message. If auditory factors interfere with visual memory during a crime, then these

findings would support the multiple resource model of attention. More importantly, crime investigators would have another situational factor to consider when determining eyewitness memory accuracy. Because the United States contains such a diverse population of people, many of whom speak with an accent, these research findings have the potential to substantially contribute to the criminal justice field.

Multiple Resource Model of Attention

The multiple resource model of attention suggests that attentional resources are divided into separate pools (Wickens, 2008). Two of the pools, the auditory and visual ones, contain attentional resources that can be used only for tasks in that specific modality. These two are nested inside a general pool which can be used for a task in either modality when the task requires more resources than are available in the modality-specific pool (see Figure 1). Because the attentional resources in all three pools are finite, simultaneous tasks in both modalities that are demanding and thus require resources from the general pool will result in a competition for resources and may impair a person's ability to complete one or both tasks successfully.

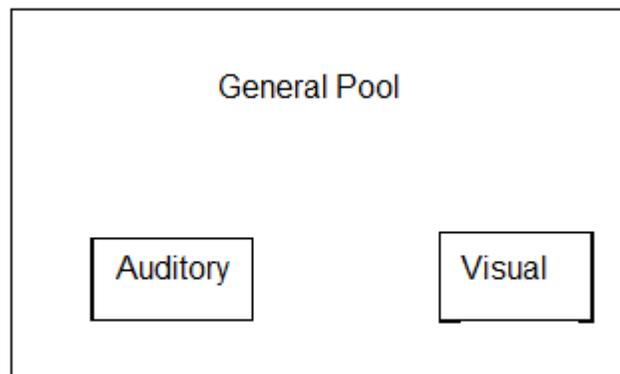


Figure 1. Multiple resource model of attention.

A visual task can interfere with an auditory task. One example of cross-modal interference can be seen in Pickel, French, and Betts' (2003) study in which they investigated whether a difficult visual task could interfere with a difficult auditory task. Participants were presented with one of four videos that showed a man holding a weapon or another object and saying a message that was either easy or difficult to comprehend. Compared to participants who saw the man holding a neutral object (easy visual task), those who saw him holding a weapon (difficult visual task) recalled the difficult message content less accurately. According to the authors, encoding the perpetrator's appearance was a difficult visual task because the weapon drew attentional resources from both the visual and general pools. When the auditory task was also difficult because the witness was attempting to encode complex message content, there were not enough general attentional resources to completely support both tasks, and performance on the secondary task (processing the message) suffered. Therefore, the message was poorly remembered.

An auditory task can interfere with a visual task. According to the multiple resource model, it should also be possible to produce the opposite effect by making the auditory task the primary one and the visual task secondary. In this case, a difficult auditory task could be produced through an accented voice or threatening message content that would require attentional resources from both the auditory and general pools (the reasons for this will be explained in more detail later). The participants could then be asked to perform a difficult visual task, such as recalling information about the perpetrator's appearance, which would require attentional resources from the visual and

general pools. Because the auditory task is the primary task, participants' performance on visual recall should reflect interference.

Pickel (2009) considered the possibility that an auditory task could interfere with a visual task and serves as a basis for the current study. Pickel's Midwestern U.S. participants watched a video that portrayed a carjacker providing either easy or difficult instructions and speaking in either a Midwestern or an Irish accent. The easy and difficult instructions varied according to the amount of information given by the carjacker, with the easy instructions containing 115 words and the difficult instructions containing 197 words. The participants were told before watching the video that they needed to pay close attention to what the carjacker said as they would be asked to play the role of victim and imagine that they would have to follow the instructions or risk injury. Thus, the auditory task was primary and the visual task secondary. Although the carjacker informed the witnesses that he had a gun in his pocket, the weapon was never shown and therefore no weapon focus effect occurred. Also, the tone and volume of the carjacker's instructions did not change between the conditions.

After the witnesses watched the video, they were asked to recall the carjacker's message and visual details about him, such as his clothing and facial features. After that task was complete, each witness was asked to identify the carjacker in a target-present photo lineup that included five foils. The witnesses were then asked to identify the carjacker's voice from a target-present recording of voice samples that included five foils. In both identification tasks, witnesses were allowed to answer that the carjacker was not present in the lineup.

Pickel found that witnesses who heard the Midwestern accent reported significantly more correct details and fewer incorrect details about the carjacker's statement than those who heard the Irish accent. She also found that witnesses who heard the easy instructions reported significantly more correct details and fewer incorrect details than those who heard the difficult instructions.

Consistent with the multiple resource model of attention, witnesses who heard the Midwestern rather than the Irish accent reported significantly more correct and fewer incorrect details about the carjacker's appearance. Additionally, witnesses who heard the easier instructions reported significantly more correct details about the carjacker's appearance. None of the accent or instruction difficulty conditions produced different results for the photo lineup. This is not surprising because recognition tasks are less sensitive measures of memory than recall tasks. However, witnesses who heard the Midwestern accent were significantly more likely to correctly identify the carjacker's voice in the voice lineup.

Accented Speech

Pickel (2009) assumed that auditory tasks are demanding if the speaker has an accent versus no accent. The literature seems to support such an assumption with several studies suggesting that accented speakers are harder to understand and require more effort to comprehend (Bent & Bradlow, 2003; Munro & Derwing, 1995a; Munro & Derwing, 1995b). Bent and Bradlow (2003) found that native listeners consider native speakers easier to understand than non-native speakers, regardless of the non-native speaker's ability to speak the listener's native language. This seems to suggest that trying to encode

and remember the content of an accented message should be more difficult than for an unaccented message.

Munro and Derwing (1995a) asked participants to listen to a series of sentences spoken in English by native English and Mandarin speakers and to transcribe those sentences word for word. This method was used to assess message intelligibility, or the extent to which the message was understood. They found that transcriptions for the Mandarin speakers contained three times the number of errors compared to those for English speakers. They also asked participants to rate each sentence in terms of perceived comprehensibility, or the extent to which the listener believed that they understood the message. The results showed that there was not always a perfect relationship between the intelligibility scores and comprehensibility ratings. Munro and Derwing suggest that two accented sentences may both be understood, and therefore rank high on intelligibility, but one sentence may require more resources to process, thus scoring lower on comprehensibility. These findings suggest that accented messages may require more resources to understand and remember than unaccented messages.

In a similar study, Munro and Derwing (1995b) asked participants to listen to and transcribe sentences spoken in English by native English and Mandarin speakers. They were also asked to judge whether each sentence was true or false, and reaction time was recorded. As in the last study, participants produced significantly more errors in the accented condition than the unaccented. They also rated accented statements as less comprehensible than unaccented ones. Moreover, participants tended to take longer to decide whether accented statements were true or false compared to unaccented

statements. These results imply that accented messages are more difficult to process and require more time and resources to do so.

Earwitness Identification of Accented Voices and Voices Speaking a Foreign Language

One of the common findings in the voice identification literature is that listeners identify targets who are speaking the listener's native language without any accent better than they identify targets who are speaking either a different language or the listener's native language with an accent. Philippon, Cherryman, Bull, and Vrij (2007) had native English listeners watch a video portraying a crime in which the perpetrator spoke in either English or French. The listeners were then asked to identify the perpetrator's voice in a lineup. Philippon et al. found that voices were recognized better when the perpetrator spoke in the listener's native language.

Similarly, Thompson (1987) asked monolingual English listeners to identify targets who were speaking either English with no accent, Spanish, or English with a Spanish accent. They found that listeners identified the English speakers with no accent the best, Spanish speakers the worst, and identification of those speaking English with an accent was between the other two conditions. Similarly, Thompson suggested that people develop a schema for the standard way that a language should sound. In the case of a target speaking accented English, word pronunciation differs between the listener's schema and the accented speech, which makes it difficult for listeners to understand and identify the target.

Thompson's finding is further supported by research conducted by Goggin, Thompson, Strube, and Simental (1991). In a series of studies, Goggin et al. found that

monolingual listeners identified a voice better when the speaker was speaking their native language rather than another language. However, bilingual listeners identified the same voice speaking in different languages at approximately the same rate. These findings provide evidence to suggest that an earwitness should have the best chance of identifying a perpetrator's voice when that perpetrator is speaking in a language that the listener understands. As a last piece of evidence for this point, Goggin et al. found that when a passage in English was manipulated in ways that made it sound less like English, such as changing the order of the words or reversing the words, participants performed poorer at voice recognition.

Threatening Message Content

Another variable that may lead to higher consumption of attentional resources is threatening message content. A perpetrator might threaten to harm the victim, and such a message could be considered a stressful stimulus. Deffenbacher (1994) and Deffenbacher, Bornstein, Penrod, and McGorty (2004) suggested that there are two types of arousing stimuli that could affect the memory of an event. He suggested that negative emotional stimuli (e.g., watching a bunny get hit by a car) would produce an orienting response where heart rate and blood pressure would decrease and attention would be directed to the most informative cues, thus improving memory for central details while having no effect on peripheral details. On the other hand, stressful stimuli (e.g., seeing a tornado heading for your house) produce a defensive response where heart rate and blood pressure increase, along with feelings of cognitive anxiety, leading to impairment of all memory except for the gist. If threatening message content is a stressful stimulus that

consumes attentional resources from both the auditory and the general pool, then it should result in memory deficits for visual identification and recall tasks.

Likewise, Easterbrook (1959) suggested that as stress increases, people can attend to less information and therefore must allocate more attentional resources toward the most informative or useful pieces of information at the cost of other pieces. If a threatening message increases a witness's stress level, the witness would have to focus his or her attention on the information that is most important in the situation. Because the message contains instructions to avoid a potential threat, witnesses should primarily allocate attentional resources toward listening to and understanding the message rather than to encoding visual stimuli.

Current Study

This study was meant to be a conceptual replication of Pickel's (2009) study with slight variations in the actual design. The purpose was to determine whether or not a perpetrator's accent and threatening message content interfere with visual memory, as predicted by the multiple resource model of attention. Participants watched one of four versions of a scene in which they were asked to imagine themselves as the bank manager during a bank robbery. The perpetrator spoke with either a Midwestern or Serbian accent, and delivered a message either low or high in threat. After watching the video, witnesses were asked to recall the message content and physical description of the perpetrator. They were also asked to identify the perpetrator's voice and photo from within lineups.

Predictions.

Memory for perpetrator's appearance. Replicating Pickel's (2009) findings, witnesses who hear the foreign, compared to the Midwestern, accent should provide

fewer correct and more incorrect details because encoding a message spoken in a foreign accent is a more demanding task that should consume more attentional resources.

Furthermore, witnesses who hear the message that is high rather than low in threat should provide fewer correct and more incorrect details because encoding threatening message content is also a more demanding auditory task that should consume more attentional resources.

Photo lineup. Although Pickel (2009) found no difference, witnesses who hear the Serbian, compared to the Midwestern, accent should be less likely to correctly identify the perpetrator. Similarly, witnesses who hear the high rather than low threat message should be less likely to correctly identify the perpetrator. Because the photo lineup was a recognition task rather than a recall task like the previous measure, this task is less sensitive to possible impairments. However, the multiple resource model predicts that, because the photo recognition task draws from visual memory, participants should show memory impairment when the auditory task is more difficult.

Memory for message content. The multiple resource model makes no clear prediction regarding whether accent or threatening content should have affected memory for message content. Because the auditory task is primary, any differences would not reflect cross-modal interference. However, Munro and Derwing (1995b) found that participants whose native language was English produced significantly more errors in transcriptions when listening to Mandarin speakers rather than English speakers. This may help to explain why Pickel (2009) found that accent did produce an affect on memory, which this study should also find.

Voice lineup. Based on Thompson's (1987) research, witnesses who hear the Serbian, compared to the Midwestern, accent should be less likely to correctly identify the perpetrator's voice because encoding occurred with a foreign accent rather than in their native language. This finding would also replicate Pickel's (2009) results.

Method

Participants

This study used 150 participants (32-41 per condition) from the introductory psychology subject pool at Ball State University. Five additional students participated in the study, but because they left entire sections of the questionnaire blank, their data were not included in the analysis. The participants' ages ranged from 18 to 55 years ($M = 19.93$, $SD = 4.387$). Ninety-two of them were female and 58 were male. One hundred and twenty-seven of the them indicated that they were White, 11 were Black, 2 were Asian, 1 was Latino, and 9 indicated "other." The pilot study used 68 participants (33-35 per condition). All participants were native English speakers from the Midwestern U.S., and none were fluent in Serbian or any related language.

Procedure

Pilot study. Previous research suggested that a speaker's accent could potentially activate a negative stereotype (Munro & Derwing, 1995b; Yarmey, 2007), which in turn could conceivably affect what observers notice and recall about the speaker. To ensure that attitudes toward the speakers were not different between the accent conditions, a pilot study was conducted. Participants were tested in groups of up to 10 students. They were assigned randomly to watch one of four videos (described in the following section) that showed a bank robber standing in the bank manager's office giving directions on

how to hand over the bank's money. After watching, the participants completed a social distance measure (Winer, Bonner, Blaney, & Murray, 1981; see Appendix A) which revealed their attitudes toward the target. The measure was scored by summing the responses to the six items, with higher scores reflecting a more negative attitude.

A factorial ANOVA revealed no significant main effect of the accent used in the video ($p = .15$). There was also not a significant interaction between the accent and level of threat ($p = .88$). However, there was a significant main effect of the level of threat, $F(1, 64) = 8.43, p = .005$, such that witnesses indicated a greater desire for social distance in the high threat condition.

Main study. Participants completed the experiment in groups of no larger than 10 students in a testing room that contains a television, DVD player, and desks. All of the desks had a clear view of the television and the volume on the television remained constant and sufficiently loud for anyone with normal hearing. Participants were asked to imagine themselves as a bank manager during a bank robbery. Before watching the video, the witnesses were told to pay close attention to the perpetrator's message because during a real robbery they would need to remember and follow his instructions. Each group of witnesses was randomly assigned to watch one of four approximately one minute long videos that depicted a bank robber standing in the bank manager's office and giving instructions about handing over the bank's money. The perpetrator was facing the camera throughout the video with only his torso, arms, and head visible. The only object in the frame other than the perpetrator was a cream colored wall. One independent variable was the bank robber's accent (Midwestern or Serbian). The other independent variable was the level of threat in the message content (high or low; see Appendix B).

After watching the video, witnesses were asked to fill out a questionnaire that assessed their memory for both the bank robber's message and appearance and collected demographics about each witness (see Appendix C). The questionnaire included a manipulation check for threat to make sure that there was a difference between the high and low threat messages. Witnesses responded to the question "How threatening are the robber's words?" using a 7-point Likert scale, with 1 being not at all threatening and 7 being very threatening.

After completing the questionnaire, witnesses were asked one at a time to move to the desk at the back of the room where the experimenter conducted a photo and voice lineup. For the photo lineup, witnesses were asked to identify the bank robber in a six-person, target-present, simultaneous lineup. Witnesses were given the option of responding that the bank robber's photo was not present in the lineup. After making a selection, witnesses were asked to rate their level of confidence on a 7-point Likert scale, with 7 being extremely confident.

After the photo lineup, the witnesses were asked to complete a voice lineup. They put on headphones and listened to a six-person, target-present lineup with the voices in one of two randomly assigned orders. Each voice in the voice lineup repeated the same syllable (i.e., "ee") five times while trying to keep all other vocal characteristics, such as tone and volume, the same. The syllable used was chosen because it sounds the same regardless of the accent. After hearing all six voices, the witnesses were asked to identify one of the voices as the bank robber or indicated that his voice was not present. They also rated their level of confidence as with the photo lineup.

Results

Except where noted, factorial ANOVAs were used to analyze all dependent variables described below.

Threat Manipulation Check

As expected, there was a significant difference between the levels of threat when witnesses were asked how threatening the perpetrator's words were, $F(1, 146) = 28.22, p < .001$, such that the high threat condition was rated as more threatening. Also, there was no main effect of accent ($p = .82$) and no interaction ($p = .25$).

Memory for Perpetrator's Appearance

Two independent coders blind to the conditions scored witnesses' memory for the statement and their memory for the perpetrator's appearance separately based on scoring keys that identified correct details. For example, in the section where witnesses were asked to write down what the perpetrator said, a witness could have written that he said he "had a gun". This detail would be counted as a correct detail. Any detail that was provided by a witness that was not on the scoring key was counted as incorrect. The coders then tallied the number of correct and incorrect details for each section to use in the analyses. The coders' interrater reliability was .96 for the perpetrator's statement ($n = 50$) and .95 for the perpetrator's appearance ($n = 50$).

Regarding the number of correct details that the witnesses provided about the perpetrator's appearance, there were significant main effects of both accent, $F(1, 146) = 17.15, p < .001$, and level of threat, $F(1, 146) = 14.57, p < .001$ (see Table 1). For accent, witnesses who heard the Midwestern accent provided more correct details as compared to the Serbian accent. For level of threat, witnesses who heard the low threat statement

provided more correct details compared to the high threat statement. There was not a significant interaction ($p = .86$).

For the number of incorrect details about the perpetrator’s appearance, again there were significant main effects of both accent, $F(1, 146) = 12.62, p = .001$, and level of threat $F(1, 146) = 10.14, p = .002$. For accent, witnesses who heard the Serbian accent provided more incorrect details compared to the Midwestern accent. For level of threat, witnesses who heard the high threat statement provided more incorrect details than with the low threat statement. There was also a marginally significant interaction, $F = 3.36, p = .069$; level of threat had more of an effect on the number of incorrect details when the perpetrator’s accent was Midwestern rather than Serbian.

Table 1
Witnesses' Memory as a Function of Accent and Threat

		Memory for Perpetrator's Appearance				Photo Lineup				Voice Lineup			Memory for Message Content			
		Correct Details		Incorrect Details		Correct Identification	Confidence			Correct Identification	Confidence		Proportion of Correct Details		Incorrect Details	
Accent	Threat	Mean	Standard Deviation	Mean	Standard Deviation	Percentage	Mean	Standard Deviation	Percentage	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	
Midwest	Low	19.10	4.23	4.37	1.96	26.83	4.15	1.15	17.07	4.22	1.33	0.46	0.10	1.39	1.16	
	High	16.78	4.45	6.75	3.22	21.88	4.16	1.08	15.63	4.31	1.15	0.36	0.08	2.94	1.83	
	Total	18.08	4.45	5.41	2.83	24.66	4.15	1.11	16.44	4.26	1.25	0.42	0.10	2.07	1.67	
Serbian	Low	16.58	3.55	6.93	2.72	32.50	4.10	1.19	7.50	4.23	1.27	0.42	0.10	2.48	1.68	
	High	14.03	3.25	7.57	3.58	37.84	4.51	1.19	5.41	4.43	1.12	0.33	0.06	3.05	1.79	
	Total	15.35	3.62	7.23	3.16	35.06	4.30	1.20	6.49	4.32	1.20	0.38	0.09	2.75	1.75	
Total	Low	17.85	4.09	5.63	2.68	29.63	4.12	1.17	12.35	4.22	1.29	0.44	0.10	1.93	1.53	
	High	15.30	4.07	7.19	3.42	30.43	4.35	1.15	10.14	4.38	1.13	0.34	0.07	3.00	1.80	
	Total	16.68	4.26	6.35	3.13	30.00	4.23	1.16	11.33	4.29	1.22	0.40	0.10	2.42	1.74	

Photo Lineup

A loglinear analysis indicated there were no significant main effects of accent ($p = .16$) or level of threat ($p = .96$) and no interaction ($p = .49$) for the accuracy of the photo identification. Likewise, a factorial ANOVA did not reveal any significant main effects

of accent ($p = .415$) or level of threat ($p = .27$) and no interaction ($p = .29$) for reported confidence in the photo selection.

Voice lineup

A loglinear analysis showed a marginally significant main effect of accent, $\chi^2 = 3.72$, $p = .05$. Witnesses who heard the perpetrator with a Midwestern accent were more likely to make a correct identification than witnesses who heard the Serbian accent. There was no significant main effect of level of threat ($p = .73$) and no interaction ($p = .83$) for the accuracy of the voice identification. Likewise, a factorial ANOVA did not reveal any significant main effects of accent ($p = .76$) or level of threat ($p = .46$) and no interaction ($p = .78$) for reported confidence in the voice selection.

Memory for Message Content

Because the witnesses heard slightly different statements based on the level of threat, I needed to compensate for the high threat condition having more correct details that could be provided (96) than the low threat condition (78). To do so, I took the number of correct details provided by each witness and divided by the maximum number of correct details that could have been provided based on the level of threat condition. I then used this proportion of correct details in the analysis. For the proportion of correct details reported about the perpetrator's statement, there were significant main effects of both accent, $F(1, 146) = 5.55$, $p = .02$, and level of threat, $F(1, 146) = 42.29$, $p < .001$. For accent, witnesses who heard the Midwestern accent provided a higher proportion of correct details as compared to those who heard the Serbian accent. For level of threat, witnesses who heard the low threat statement provided a higher proportion of correct

details than those who heard the high threat statement. There was no significant interaction ($p = .52$).

For the number of incorrect details reported about the perpetrator's statement, there were main effects of both accent, $F(1, 146) = 5.1, p = .03$, and level of threat, $F(1, 146) = 15.99, p < .001$. For accent, witnesses who heard the Serbian accent provided more incorrect details than those who heard the Midwestern accent. For level of threat, witnesses who heard the high threat statement provided more incorrect details as compared to the low threat statement. Again, there was no significant interaction ($p = .07$).

Discussion

The results of the pilot study showed that the Serbian accent could be used to test auditory interference on visual memory without tapping negative stereotypes about the perpetrator that were due simply to his accent. Furthermore, the threat manipulation check verified that the high threat statement was actually considered more threatening by the witnesses than the low threat statement. One interesting finding from the social distance measure is that witnesses indicated wanting greater social distance from the perpetrator when he said the higher threat statement. This finding may simply reflect a successful threat manipulation.

In regards to the main study, the results replicated several of Pickel's (2009) findings. Perhaps the most important is that this study found significant differences based on accent and level of threat for the number of correct and incorrect details that the witnesses provided about the perpetrator's appearance. These results show direct support for the multiple resource model of attention. When the auditory task was more difficult

(i.e., Serbian accent), the witnesses provided fewer correct and more incorrect details about the perpetrator's appearance. This was the predicted result because past research has suggested that foreign accents are harder to understand and require more effort to comprehend (Bent & Bradlow, 2003; Munro & Derwing, 1995a; Munro & Derwing, 1995b). Witnesses who heard the statement with the Serbian accent had to use more attentional resources to encode this auditory information; thus there were fewer attentional resources available to encode visual information about the perpetrator.

The witnesses also provided fewer correct and more incorrect details about the perpetrator's appearance when they heard the high threat statement as compared to the low threat statement. Again, this was the predicted result because the high threat statement should have led to a relatively higher level of stress or arousal which would have resulted in witnesses focusing more attentional resources on encoding auditory information at the expense of visual information. If the witnesses' levels of stress or arousal got high enough, their overall amount of available attentional resources could have been reduced, therefore leaving fewer resources to encode any information as compared to those witnesses who heard the low threat statement (Deffenbacher, 1994; Deffenbacher et al., 2004; Easterbrook, 1959).

On the other hand, the photo lineup did not produce any significant results, which also replicates Pickel (2009). The multiple resource model predicted that this visual task could be impaired by difficult auditory tasks. However, as it was pointed out before, a photo lineup is a recognition task rather than a recall task like the one used for the perpetrator's appearance and tends to be a less sensitive measure of visual memory.

For the voice lineup, I found a marginally significant main effect of accent, which again replicates Pickel's (2009) study and supports Thompson's (1987). In both of these studies, subjects were less likely to correctly identify a voice in a lineup when the voice was encoded in the subject's native language with a foreign accent than if there was no accent. In the present study, when the witnesses heard the statement spoken with a Serbian accent, they were less likely to correctly identify the perpetrator's voice in the voice lineup than those witnesses who heard the statement spoken with a Midwestern accent.

In addition, for both the photo lineup and voice lineup, the witnesses' confidence in their selection was not significantly related to accent or level of threat. This is not really surprising due to general trends in the eyewitness literature that suggests that confidence can be influenced by a number of factors other than accuracy. However, it did seem possible that accent could affect confidence ratings for the voice lineup because witnesses may feel that they would have recognized an accented voice in the lineup. Unfortunately, this result was not found in this study, but may warrant further research.

Although the measure of memory for message content is not relevant to the multiple resource model, it does provide interesting information about different types of tasks within the same mode. Witnesses who heard the Serbian accent provided a lower proportion of correct details and more incorrect details about the perpetrator's statement than the witnesses who heard the Midwestern accent, which replicates Pickel's (2009) findings. This result also shows support for Munro and Derwing's (1995b) findings, in that people who try to transcribe what was said by a person with an accent will have a

more difficult time and will be less accurate than people who have heard a person without an accent.

Based on the results of the memory for the perpetrator's appearance, witnesses seem to have allocated more attentional resources toward encoding auditory information at the expense of encoding visual information. However, across different conditions the auditory information was not encoded with the same degree of accuracy. Witnesses who heard the Midwestern accent performed better on the auditory recall task than those witnesses who heard the Serbian accent. These findings definitely suggest that accented speech is more difficult to understand and requires more effort and resources to encode. However, even if witnesses listening to the message spoken with a Serbian accent allocate extra attentional resources to processing that message, it appears that they are unable to maintain the same level of performance achieved by witnesses in the Midwestern accent condition.

One new and interesting finding for this study is that witnesses who heard a high threat statement provided a lower proportion of correct details and more incorrect details about the perpetrator's statement than witnesses who heard the low threat statement. This finding may reflect increased levels of arousal (Deffenbacher, 1994; Deffenbacher et al., 2004) or increased levels of stress (Easterbrook, 1959) that led to impairments in encoding or processing of information related to the perpetrator and the situation due to this threatening stimulus. As stress increases and attentional capacity decreases, witnesses should focus on those details that are most important. In this case, perhaps witnesses focused on only parts of the perpetrator's statement because of the high threat level.

Levels of stress and arousal may not have increased as much for witnesses who heard the low threat statement, thus allowing them to focus on more of the statement.

In the end, this study provides support for the multiple resource model of attention in eyewitness memory and evidence that difficult auditory tasks can interfere with visual memory. Specifically, a perpetrator speaking with a foreign accent or making a high threat statement may impair visual memory, thus leading to less accurate descriptions being provided. This is a particularly important finding because of the growing number of immigrants and tourists that come to not only the United States, but to every other country in the world as well. Within any particular country, crimes occur on a daily basis. It is completely possible that when a crime is committed, the perpetrator and the witnesses will have different accents, which as this study shows could lead to poorer memory for details about the perpetrator. At the same time, several different types of crimes require that the perpetrator give orders to the victims, which often tend to be threatening in nature. Again, this study suggests that these threatening orders could result in poorer memory for the perpetrator.

It may be counterintuitive that auditory information can interfere with visual memory. Therefore, it is extremely important for crime investigators to be aware of this potential interference and consider its influence when judging the accuracy and usefulness of eyewitness statements. When collecting statements and descriptions from witnesses, crime investigators need to be aware of whether the perpetrator said anything to the witness during the crime. They need to ask not only what was said, but also how the perpetrator said it. Specifically, crime investigators need to ask whether the perpetrator spoke with what the witness would consider an accent. They also need to ask

if the witnesses felt like they had trouble understanding what the perpetrator was saying. Both of these factors could contribute to visual memory being impaired, which crime investigators need to take into account when considering the accuracy of the statement.

Crime investigators also need to ask whether the perpetrator made any statements that the witness considered threatening. As the present study showed, threatening statements can also interfere with visual memory. If the witness reports remembering threatening statements, then crime investigators should be aware that this could lead to less accurate visual descriptions of the perpetrator. These inaccuracies may force crime investigators to consider more information from the crime scene than just simply a description from the witness.

One important point to make is that this study reflects the memory for a witness who is directly involved in the crime. In order for the auditory task to be considered the primary task, the witness must be motivated to listen carefully to and encode what the perpetrator is saying. The motivation may be due to any number of things, but one possibility is that the witness is directly affected by what the perpetrator is saying. It is possible that a witness who is simply a bystander will not be as concerned with what the perpetrator is saying but instead will focus on where the perpetrator is and what that person is doing, which are both pieces of visual information. Whether or not there is a significant difference between victim and bystander witnesses is one area that needs further research. Past studies have produced mixed results with some finding no difference between victim and bystander witnesses (Behrman & Davey, 2001; Hosch & Cooper, 1982; Hosch, Leippe, Marchioni, & Cooper, 1984) while others have found that victim witnesses tend to have more accurate memory about the perpetrator than

bystanders (Christianson & Hübner, 1993; Hosch & Bothwell, 1990). However, these past studies have focused on encoding and reporting primarily visual information about a perpetrator. Future research needs to consider whether or not including auditory information in addition to visual information leads to differences in the memory reports of victim versus bystander witnesses. Investigators need to clarify whether the witness was a victim or a bystander. The present results suggest that, if the witness was a victim, then they definitely need to take into account how details about the auditory task could interfere with the witness's visual memory.

Limitations

One limitation of this study is that it only considered one particular foreign accent in relation to a population whose native accent is Midwestern. Based on this study, we know that people who hear a speaker with a Serbian accent when they typically hear only Midwestern accents will have more difficulty understanding and comprehending what the person is saying. We also know that the same results occur when the speaker has an Irish accent (Pickel, 2009). If the listener is focused on trying to understand what the speaker is saying, then he or she will have fewer attentional resources to use to encode visual information and will therefore be less likely to remember details about what the speaker looked like. However, we do not know if all foreign accents will lead to the same results. It may be possible that some foreign accents are easier or harder for people to understand. Maybe a Chinese accent makes a speaker harder to understand than a Serbian accent because of the differences in phonemes in each language. We also do not know if witnesses with native accents other than Midwestern would also have as much difficulty

with a Serbian accent. Perhaps it is easier or harder for a person with a Southern United States accent to understand a person with a Serbian accent.

Another limitation is that the witnesses were asked to watch a video portraying a bank robbery in which they imagined they were the bank manager. Just in regards to the level of threat, it seems likely that a bank manager physically placed into the scene portrayed in the video would have a more acute experience of that threat. We would be more likely to see higher levels of stress or arousal in response to that threat. The present results indicate that a highly threatening statement spoken by a perpetrator leads to poorer visual memory for the bank robber. But we do not know whether we would see an even larger difference between the high and low threat statements if the robbery was real. The results of this study may have been compressed because we could only expose witnesses to an imagined threat, rather than exposing them to an actual threat.

Future Research

Even though there are some limitations to the generalizability of this study's results, this study does lend itself well to several paths of future research. First, researchers need to consider different combinations of accents to see if some lead to better understanding than others. For instance, maybe a listener with a native Midwestern accent has an easier time understanding a speaker with a Southern accent than a one with a German accent. At the same time, crimes do not happen only in the United States, so considering different combinations of accents from other countries would be very useful as well. Perhaps a listener with a native French accent has an easier time understanding a speaker with a Spanish accent than one with a Japanese accent. The main reason for

testing these combinations is because we may find varying levels of impairment for visual memory based on the difficulty of understanding between two different accents.

Second, researchers should consider what other factors related to a perpetrator's statement could make the auditory task more difficult, and thus impair encoding of visual information. One possibility is characteristics of the perpetrator's voice such as tone or volume. When a person talks very quietly, it may require the listener to use more effort to listen to and understand what the person is saying than if the speaker simply spoke at a normal level. Another possibility is background noise that is either distracting or interferes with the listener's ability to hear the perpetrator. It may be possible that something like a loud siren is enough to draw more of a person's attention to that auditory information at the expense of the perpetrator's visual information.

References

- Behrman, B. W., & Davey, S. L. (2001). Eyewitness identification in actual criminal cases: An archival analysis. *Law and Human Behavior, 25*, 475-491.
- Bent, T., & Bradlow, A. R. (2003). The interlanguage speech intelligibility benefit. *Journal of the Acoustical Society of America, 114*, 1600-1610.
- Christianson, S. Å., & HübINETTE, B. (1993). Hands up! A study of witnesses' emotional reactions and memories associated with bank robberies. *Applied Cognitive Psychology, 7*, 365-379.
- Deffenbacher, K. A. (1994). Effects of arousal on everyday memory. *Human Performance, 7*, 141-161.
- Deffenbacher, K. A., Bornstein, B. H., Penrod, S. D., & McGorty, E. K. (2004). A meta-analytic review of the effects of high stress on eyewitness memory. *Law and Human Behavior, 28*, 687-706.
- Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review, 66*, 183-200.
- Goggin, J. P., Thompson, C. P., Strube, G., & Simental, L. R. (1991). The role of language familiarity in voice identification. *Memory & Cognition, 19*, 448-458.
- Hosch, H. M., & Bothwell, R. K. (1990). Arousal, description, and identification accuracy of victims and bystanders. *Journal of Social Behavior and Personality, 5*, 481-488.
- Hosch, H. M., & Cooper, D. S. (1982). Victimization as a determinant of eyewitness accuracy. *Journal of Applied Psychology, 67*, 649-652.

- Hosch, H. M., Leippe, M. R., Marchioni, P. M., & Cooper, D. S. (1984). Victimization, self-monitoring, and eyewitness identification. *Journal of Applied Psychology, 69*, 280-288.
- Munro, M. J., & Derwing, T. M. (1995a). Foreign accent, comprehensibility, and intelligibility in the speech of second language learners. *Language Learning, 45*, 73-97.
- Munro, M. J., & Derwing, T. M. (1995b). Processing time, accent, and comprehensibility in the perception of native and foreign-accented speech. *Language and Speech, 38*, 289-306.
- Philippon, A. C., Cherryman, J., Bull, R., & Vrij, A. (2007). Earwitness identification performance: The effect of language, target, deliberate strategies and indirect measures. *Applied Cognitive Psychology, 21*, 539-550.
- Pickel (2009). The effect of a perpetrator's accent on eyewitness memory. Unpublished data.
- Pickel, K. L. (2007). Memory and eyewitness memory. In S. F. Davis & W. Buskist (Eds.), *21st century psychology*. Thousand Oaks, CA: Sage Publications.
- Pickel, K. L., French, T. A., & Betts, J. M. (2003). A cross-modal weapon focus effect: The influence of a weapon's presence on memory for auditory information. *Memory, 11*, 277-292.
- Thompson, C. P. (1987). A language effect in voice identification. *Applied Cognitive Psychology, 1*, 121-131.
- Wells, G. L., Memon, A., & Penrod, S. D. (2006). Eyewitness evidence: Improving its probative value. *Psychological Science in Public Interest, 7*, 45-75.

Wickens, C. D. (2008). Multiple resources and mental workload. *Human Factors, 50*, 449-455.

Winer, D. L., Bonner, T. O., Blaney, P. H., & Murray, E. J. (1981). Depression and social attraction. *Motivation and Emotion, 5*, 153-166.

Yarmey, A. D. (2007). The psychology of speaker identification and earwitness memory.

In R. C. L. Lindsay, D. Read, D. Ross, & M. P. Toglia (Eds.), *The handbook of eyewitness psychology: Vol. 2. Memory for people* (pp. 101-136). Mahwah, NJ: Lawrence Erlbaum Associates.

Appendix A
Social Distance Measure

The questions below refer to the man you saw in the video. For each question, please circle one number.

1. Would you like to meet this man?
definitely yes 1 2 3 4 5 6 7 definitely no

2. Would you be willing to work on a job with him?
definitely yes 1 2 3 4 5 6 7 definitely no

3. Would you invite him to your home?
definitely yes 1 2 3 4 5 6 7 definitely no

4. Would you be willing to be his neighbor?
definitely yes 1 2 3 4 5 6 7 definitely no

5. How likely is it that he could become a close friend of yours?
very likely 1 2 3 4 5 6 7 very unlikely

6. Would you ask him for advice?
definitely yes 1 2 3 4 5 6 7 definitely no

Appendix B

Video Script

Subject is told to imagine being a bank manager sitting in his/her office at work one day when the target enters the office. The video shows the target in front of a white office wall. The target mentions having a gun, but no gun is visible in the video.

High Threat Condition

I have a gun in my jacket, so do what I tell you **or I swear I'll splatter your brains all over this office.**

I have an accomplice who's standing in the lobby near your security guard right now. **He will kill the guard and start shooting customers if you** activate the alarm.

You will leave your office and turn left. Go to the loan officer's cubicle and tell her you're going to lunch. I'll be watching, so don't say anything else **or both of you will leave this bank in body bags.**

Then walk back past your office and go to the vault. Open it and go inside. I'll give you two large cloth bags. Fill them three fourths of the way with cash and then tie the drawstrings.

Now listen carefully **or I'll kill you.** Carry the bags out of the vault and turn right. I'll follow you. Go out the east door to the parking lot and look for a dark blue Ford truck. Approach from the front and give the money to the driver. Then walk over to the sign by the street that says "exit only" and stand there. Don't move until after we have driven away.

If you follow these directions, no one will get hurt.

Low Threat Condition

I have a gun in my jacket, so do what I tell you.

I have an accomplice who's standing in the lobby near your security guard right now. Don't try to activate the alarm.

You will leave your office and turn left. Go to the loan officer's cubicle and tell her you're going to lunch. I'll be watching, so don't say anything else.

Then walk back past your office and go to the vault. Open it and go inside. I'll give you two large cloth bags. Fill them three fourths of the way with cash and then tie the drawstrings.

Now listen carefully. Carry the bags out of the vault and turn right. I'll follow you. Go out the east door to the parking lot and look for a dark blue Ford truck. Approach from the front and give the money to the driver. Then walk over to the sign by the street that says "exit only" and stand there. Don't move until after we have driven away.

If you follow these directions, no one will get hurt.

Appendix C
Questionnaire

Please think about the man you saw in the video you just watched. Below are some questions about him. Please answer each question as accurately as possible.

What did the man tell you to do? Please write down the instructions he gave you in as much detail as possible. Please provide as much detail as necessary so you can show that you could follow the instructions exactly.

How threatening are the robber's words? Please circle one number.

Not threatening at all 1 2 3 4 5 6 7 Very
Threatening

Now please answer some questions about the man's appearance.

1. Think about the top the man was wearing.

A. What kind of a top was it?

_____ shirt _____sweater _____jacket _____sweatshirt _____ other; describe:

B. What color(s) was the man=s top?

C. Was the top long-sleeved or short-sleeved?

D. How would you describe the style? (For example, T shirt, ski jacket, football jersey, etc.)

E. Were there any other visible details, such as pockets, buttons, a zipper, rips, lettering or graphics, some type of collar, a type of fabric that you can identify, etc.?

2. Think about the pants or shorts the man was wearing.

A. Were they pants or shorts? _____pants _____shorts

B. Can you describe more specifically what kind they were? For example, if you said they were pants, were they jeans, track pants, dress pants, khakis, or some other kind?

C. What color(s) were the man=s pants or shorts?

D. Were there any other visible details, such as pockets, buttons, rips, lettering, etc.?

3. Was the man wearing glasses? _____yes _____no If you said yes, please describe them (color of frames; were they sunglasses or regular eyeglasses?):

4. Was the man wearing a hat or any kind of headgear? _____yes _____no If you said yes, please describe it. What color was it? What kind (e.g., cowboy hat, baseball cap)?):

5. A. What kind of footwear was the man wearing?

_____athletic shoes/tennis shoes _____boots _____casual shoes _____dressy shoes
_____sandals _____other; describe:

B. Refer to your answer above. Can you describe more specifically what kind of footwear he wore? For example, if you said boots, were they hiking boots, cowboy boots, or some other kind? Did they lace up or slip on? Was a brand name visible?

C. What color(s) was the footwear?

6. Was the man wearing gloves? no yes (if yes, what color?)
7. Was the man wearing any jewelry, such as a wristwatch, earring, a necklace, a bracelet, rings, or a nose ring? If you say yes, please describe the color and any other details you can recall.
8. What was the man=s ethnic background?
white black Hispanic/Latino Asian other; describe
9. About how tall was he? Please write down a specific height in feet and inches.
10. How would you describe his body type?
thin medium build overweight muscular
11. What color was his hair?
light brown dark brown red black gray blonde
other; describe:
12. How long was his hair?
shaved short (above the ears and collar) about collar-length
long (over the shoulders)
13. Exactly how old you think he is (please write down a specific number of years)?
 _____ years old
14. Did the man have any tattoos that you could see? yes no
 If yes, please describe where they were on his body and what they looked like:
15. Did the man have any scars or birthmarks that you could see? yes no
 If yes, please describe where they were on his body and what they looked like:
16. Did the man have any facial hair? yes no
 If yes, please describe what it looked like:

Demographics. Please provide some general information about yourself.

A. How old are you?

B. Are you male or female? male female

C. What is your race? For example, are you white, black/African-American, Latino/Latina, Asian-American, biracial,...?

D. Where did you grow up? Please write down a state within the U.S. or a specific country if you didn't grow up in the U.S.

E. What languages do you speak fluently (e.g., English, Spanish, French)?