COMPREHENSION OF MULTIPLE CHANNEL MESSAGES: ARE SUBTITLES MORE BENEFICIAL THAN SOUNDTRACKS?

by

MICHAEL HINKIN

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College of Arts and Sciences

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Approved by:

Major Professor
Dr. Richard Harris

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Abstract

Memory processes have undergone extensive investigation using various experimental methods. While working memory studies have profoundly influenced the development of new cognitive theories, including the Dual-Processing Theory (Mayer & Moreno, 1998), limited research has investigated the effects of subtitled messages on multimedia comprehension. Previous eye movement research has investigated the ability of observers to attend to the multiple sensory inputs associated with multimedia viewing (D'Ydewalle, Van Rensbergen & Pollet, 1987; D'Ydewalle & De Bruycker, 2007); however, eye movement research only scratches the surface of cognitive abilities associated with multimedia learning. In order to satisfy the need for more subtitling research two studies were performed to investigate the effects of subtitled movies on the comprehension of movie content. Both investigations involved the presentation of 10-minute movie clips from A Few Good Men and See No Evil, Hear No Evil. Participants completed three types of multiple-choice recognition questions for each movie, including: pictorial-only questions, verbal-only questions and combined-information questions. Experiment 1 was designed to investigate the difference between levels of comprehension, when verbal information was presented only in the participants' native language (i.e. English soundtrack and/or subtitles). Results of Experiment 1 indicate that participants performed significantly better on verbal-only and combined-information questions when their native language was present in the subtitles as opposed to the soundtrack. These findings confirm previous findings that reading verbal information in subtitles is more efficient than listening to the soundtrack. Comparison of performance on the pictorial-only questions across presentation

formats in Experiment 1 showed participants in the English soundtrack with no subtitles condition performed significantly better than all other conditions.

Although Experiment 1 provides a basic understanding of how native language soundtracks and subtitles influence comprehension of movies, subtitled media are primarily used when viewing a movie with verbal information from a foreign language. Experiment 2 built on the results of Experiment 1 by incorporating an unfamiliar language (i.e. French). The question sets used in Experiment 1 were also used in Experiment 2; however, two French vocabulary tests were also used in Experiment 2 to measure incidental foreign language acquisition. Consistent with the results of Experiment 1, participants performed significantly better on verbal-only and combined-information questions when their native language was in the subtitles. This finding extended the conclusion that native language verbal information presented visually (i.e. subtitles) yields better performance on questions requiring verbal cues than native language verbal information presented orally (i.e. soundtrack) to foreign language material. Comparison of performance on the pictorial-only questions across presentation formats in Experiment 2 showed no significant differences. Comparison across the two experiments reflected a distraction effect associated with the presence of a foreign language. Performance on the French vocabulary tests was very poor across all conditions and yielded no significant differences, suggesting that the tasks may have been too difficult.

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CHAPTER 1 - Literature Review

In 2007 United States consumers spent 9.63 billion dollars at movie box offices, compared to an astounding 26.7 billion dollars spent worldwide. This is no surprise with the 603 new releases in the U.S. for 2007 (MPAA website). Despite the obvious obsession people have for viewing movies, psychological research investigating the influence of subtitles on movie viewing is limited. Subtitling issues influence any consumer who desires to watch a film featuring a foreign language soundtrack. Although several new DVDs contain soundtracks with options of dubbing in multiple languages, many movies rely on the use of subtitles to relay the message to foreign language speakers. Since the vast majority of movies observed by Americans were produced in English, movie viewers in the United States are relatively unfamiliar with the use of subtitles. On the other hand, many consumers of American movies reside in countries whose native language is not English; therefore, they must rely on subtitles to understand the content of the film. In many such places television programs routinely contain subtitles. For example, about 20% of all programs on Dutch public and commercial television are foreign, the majority of which are in English (Schilperoord, de Groot, & van Son, 2005).

With the high demand for foreign films worldwide, the influence of subtitles is increasingly becoming an issue in movie consumption. Previous research has primarily focused on the influence of subtitles on attention and the effectiveness of subtitles for promoting foreign language acquisition. Some studies have also investigated comprehension of subtitled movies and television; however, these studies only focused on comprehension of verbal information. The current studies attempted to extend previous subtitling studies by investigating

comprehension in terms of pictorial, verbal and combined information related to movie scenes. Dual-Process Theory was used to investigate multiple-channel communication within the framework of the limited-capacity information processing perspective. The combination of these two procedures allows for probing a communication perspective of subtitled movies using a psychological theory.

Multiple-Channel Message Research

Dual-Coding and Working Memory

In order to fully grasp the issues related to the psychological role of subtitles in movie viewing, investigators must first understand the concepts associated with processing multiple sensory inputs. Paivio's (1971) dual-coding theory provides the basic assumption that information is processed in modality-specific channels; however, further investigation of the influence of simultaneous presentations of multiple information channels is required. In particular, researchers must understand how visual and auditory stimuli, presented simultaneously, affect each other in terms of working memory. According to Baddeley (1992), working memory is defined as the system that is necessary for the concurrent storage and manipulation of information. Baddeley further explains working memory as being supplemented by two subsidiary slave systems, an auditory system (phonological loop) and visual system (visuospatial sketchpad). The basic structure of working memory involves visual inputs being stored on the visuospatial sketchpad and auditory inputs being stored in the phonological loop. Since the visual and auditory inputs are originally stored in differing locations, the central executive system must process the inputs from each store and construct associations between them (Baddeley, 1992).

Development of Dual-Processing Theory

Mayer (1997) applied the concepts of working memory to multimedia learning, a technique where verbal and nonverbal stimuli are consistently presented simultaneously. Mayer conducted several experiments involving a multimedia learning scenario in which observers were instructed on the inner workings of a bicycle-tire pump. Several differing presentation methods were used including: a simultaneous congruent pictorial representation and oral narration, a simultaneous congruent pictorial and written text representation, a pictorial representation only, an oral narration only, and a text representation only (Mayer, 1997). Following the presentation of the tutorial, observers were asked to recall how the bicycle pump works in a free recall session and questions referring to specific components of the inner workings of a bicycle pump. Also, observers were presented with problem-solving scenarios where they were instructed to use the information learned from the tutorial to properly solve the scenario. Results indicated that observers presented with multiple simultaneous congruent sensory inputs showed the greatest amount of recall for the information on the proper method of using a bicycle-tire pump. Of the multiple input conditions, observers presented with a verbal narration and pictorial representations performed better on the problem-solving scenarios and were better able to describe the inner workings of the bicycle-tire pump during free recall (Mayer, 1997). In terms of the single sensory inputs, observers performed better when presented with pictorial representations alone than when given the narrative or text tutorial alone. The reasoning behind these findings had to do with the nature of the presentation methods. When observers were presented with pictures and an oral narration, they were able to incorporate the parts of each to gain a greater understanding of the material. On the other hand, when presented with a combination of two visual inputs (pictures and text), observers were not able to focus their

attention on both stimuli concurrently, which yielded less understanding compared to the presentation of a visual and oral stimulus concurrently (Mayer, 1997).

While Mayer's bicycle-tire pump experiment suggests that concurrent stimuli from differing processing modalities yield the highest retention rate of information, the explanation for this finding was unknown. In order to further investigate the problem, Mayer and Moreno (1998) devised an experiment teaching about the process of lightning formation. In this experiment college students were presented with a computer simulation involving either a pictorial representation with a corresponding written text or oral narration explaining the formation of lightning. Participants were instructed to complete the computer-based tutorials followed by a retention test, a matching test and a transfer test. The transfer test involved questions which required applying the material learned to solve four distinct problems associated with lightning formation, for instance: "What can be done to decrease the intensity of lightning?" (Mayer & Moreno, 1998). Results indicate the participants presented with the simultaneous congruent pictorial representation and narration performed better on all tasks, which is consistent with the previous findings of greater comprehension when inputs span differing information processing modalities (Mayer & Moreno, 1998). The results support the split-attention effect, where inputs from differing modalities allow the observer to distinguish between the inputs with greater efficiency, while multiple inputs in the same modality interfered with the comprehension of the material.

Based on the findings of his experiments, Mayer (1997) developed a theory known as the generative theory of multimedia learning. Mayer's theory is based on the combination of Wittrock's (1974) generative theory and Paivio's (1971) dual-coding theory. Wittrock's generative theory deals with how observers select important information, organize the

information into mental representations and integrate the new information with prior knowledge. Paivio's theory of dual-coding focuses on the use of two distinct information processing systems, a visual and verbal system for information retention. In terms of Paivio and Wittrock's theories, the basic idea of the generative theory of multimedia learning is that the learner is a knowledge constructor who actively selects and connects pieces of visual and verbal knowledge. For example, in the bicycle pump example discussed above, observers must actively attend to both the visual and verbal information relevant to how a bicycle pump works; then observers must combine the encoded information to yield better understanding. Also, the design of the multimedia instruction affects the degree to which learners engage in the cognitive processes required for meaningful learning within the visual and verbal information processing systems (Mayer & Moreno, 1998). With the development of this new theory, Mayer was able to investigate the different presentation methods discussed above to determine which presentation combinations were most effective.

Though Mayer continues to refer to his model as the generative theory of multimedia learning, he adapted the theory into what is known as the dual-processing theory of working memory. The dual-processing theory of working memory, introduced by Mayer and Moreno (1998), is based on four assumptions. The first assumption posits that working memory contains auditory and visual subsystems analogous to Baddeley's phonological loop and visuospatial sketchpad. The second assumption says that working memory has a limited storage capacity. Sweller's (1988) cognitive load theory is the underlying framework behind Mayer and Moreno's second assumption. Cognitive load theory deals with cognitive overload from an external and internal perspective. According to Sweller (1988), extraneous cognitive overload occurs when working memory becomes overwhelmed by external factors associated with the material; for

instance the format in which the material was examined. On the other hand, intrinsic cognitive overload refers to an overload caused by the basic elemental structure of the material, where each set of material has differing difficulty levels regardless of examination format. For example, a movie scene containing complex pictorial cues may result in less retention of pictorial information compared to a scene with relatively simple pictorial cues.

Mayer and Moreno's (1998) third assumption states: "Meaningful learning occurs when a learner retains relevant information in each store, organizes the information in each store into a coherent representation, and makes connections between corresponding representations in each store" (pg. 314). This assumption comes from the generative theory of multimedia learning introduced by Mayer (1997). The fourth and final assumption is that connections are formed simultaneously between the visual inputs and the auditory inputs stored in working memory. Assuming that connections form between visual and auditory inputs held in working memory is consistent with Paivio's (1971) dual-coding theory. While dual-processing theories may help to explain the effects of subtitling on comprehension of movie content, this theory has yet to be applied to the study of subtitled media.

Based on the discussion of Mayer and Moreno's dual-process theory the following predictions were made with regards to the comprehension of subtitled media. When participants are instructed to answer questions about the verbal content of a movie clip, performance would be the best when the verbal information is presented in the soundtrack and no verbal information is presented in the subtitles. Additionally, when participants are instructed to answer questions requiring a combination of verbal and pictorial information those presented with verbal information only in the soundtrack would perform better than participants presented verbal information only in the subtitles. These predictions are consistent with Mayer and Moreno's

findings that when congruent verbal and visual/pictorial information are presented in opposing modalities performance is enhanced. On the contrary, it was predicted that if participants are instructed to answer a question about the pictorial information they would perform significantly better when no verbal information was presented in the movie clip. This prediction is based on the finding that participants presented with only a pictorial representation were significantly better at identifying the inner workings of a bicycle pump when the information was only presented pictorially, than when presented a verbal and pictorial representation.

Audio/Visual Redundancy

While the dual-process theory provides a potential theoretical framework for predicting the effects of subtitled media on message comprehension, redundant audio/visual information within subtitled media provides the basis for alternative predictions. In order to address the issue of audio/visual redundancy in subtitled media, researchers must identify the characteristics associated with the processing of redundant information. Lang (1995) investigated audio/visual redundancy from a limited-capacity information processing perspective. She suggests that the depth of our ability to process information is dependent on the cognitive resources available during processing. In order for a movie or television message to be fully processed, it must be attended to, encoded into WM, stored in LTM, and be retrievable from LTM (Lang, 1995). During processing of simultaneous information in multiple modalities, the cognitive resources must be shared among the different levels; however, if sufficient resources are not available to complete all of the necessary processing, the information processing system is believed to experience overload. Consequently, when the information processing system experiences overload, information from the message may not be properly stored or retrieved from memory. Lang (1995) theorized that the encoding process is given priority when cognitive resources are

sparse, because encoding is time-dependent during the viewing of the stimuli and is partially guided by the attention responses elicited by the features of the stimuli.

Additionally, Lang (1995) claims that the different depths of processing are in direct association with measures of memory. Specifically, recognition measures are assumed to reflect the encoding process, cued recall measures reflect the storage of information, and free recall measures reflect the retrieval of information. Since recognition measures were used in the current studies, the remainder of the redundant information discussion will focus on the encoding stage of processing. According to Tulving (1972), recognition is the most sensitive measure of memory, because the item to be recognized is presented to the subject and contains multiple cues to help retrieve the information.

The association between the depths of information processing and memory measures provides a basic understanding of how information is retained within memory; however, an operational definition of redundancy is needed. Lang (1995) offers three definitions of information redundancy in regards to message presentation. Redundancy may be defined as: (1) the presence of two channels rather than a single channel; (2) an exact match in content between the audio and video channels; and (3) a close relationship in semantic meaning between the audio and video channels. The third definition of informational redundancy in terms of semantic relationships is most commonly used in studies of multimedia presentations, because this definition takes into consideration the condensing of the verbal soundtrack information within subtitles.

Discussion of the levels of redundant messages can also be categorized in terms of the amount of capacity needed to process the information presented in each channel. Single-channel messages are assumed to require the least amount of processing capacity because there is only

one input channel, resulting in less information available for encoding. Multiple-channel redundant messages, on the other hand, consist of the simultaneous presentation of two or more input channels, which are semantically similar in terms of content. The introduction of the second channel increases the amount of information available for encoding; however, it also increases the complexity of the message. Increasing the complexity of the presentation through incorporation of a second information channel requires a higher processing demand. Additionally, this increases the potential for the loss of information due to lack of encoding. Lang (1995) claims that the topic difficulty, familiarity, and complexity of presentation of the stimuli all determine the degree of processing overload, where an increase in difficulty of topic and complexity of presentation results in an increased susceptibility to overload. Also, a decrease in familiarity similarly results in an increased potential for overload.

Assuming enough cognitive resources are available to process the simultaneous presentation of multiple input channels, Lang made the following prediction in relation to recognition abilities. Observers presented multiple-channel redundant messages (e.g. a movie with closed captions) would perform better on recognition tests involving verbal information in comparison to observers presented single-channel messages (Lang, 1995). The reason for the difference in performance between single-channel and multiple-channel on verbal recognition tests is that the verbal information is time dependent, requiring more ongoing capacity to process (Basil, 1992, as cited by Lang, 1995). Furthermore, comparison of auditory (soundtrack) and visual (subtitles) verbal information reveals that visually presented verbal information yields better performance on verbal recognition tasks than auditory verbal information (Lang, 1995). Lang also notes previous research that the retention of pictorial information requires little mental effort, regardless of redundancy. When little cognitive effort is needed for processing of

pictorial information, performance on visual recognition tests do not differ between single-channel and multiple-channel messages (Lang, 1995). This assumption is based on the psychological phenomenon known as *picture memory superiority* (Paivio, 1978, as cited by Lang, 1995). The phenomenon asserts that pictorial information is better remembered because it is encoded twice. Specifically, pictorial information is encoded visually and then again through verbal recitation. Limited research has investigated the difference in recognition tests for combined visual-verbal information and the results of these experiments are inconclusive (Lang, 1995).

Based on the findings of Lang (1995), the following predictions were made with regards to comprehension performance on questions about the content of subtitled movies. Consistent with Lang's findings, it was predicted that when participants were presented with verbal content in the subtitles they would perform significantly better on verbal recognition tasks as opposed to participants presented verbal information in the soundtrack. The reason for this is visual information is assumed to require little mental effort during encoding, thus allowing for participants to efficiently process the verbal input from the subtitles. Additionally, consistent with Lang (1995), it was predicted that recognition of pictorial information would be equal across all presentation formats based on the phenomenon of picture memory superiority. Although previous findings do not allow for definitive predictions with regards to recognition questions requiring both pictorial and verbal information, it was predicted that recognition would be the highest when verbal information was presented in the subtitles. This prediction is based on the assumption that no differences would be found between presentation formats with regards to pictorial information, and thus the influential factor would be the modality in which the verbal information was presented. If verbal information is in fact more efficiently processed from the

subtitles, then one would expect participants to perform better on combined-information questions when presented verbal information in the visual modality.

Encoding Specificity

Research focusing on dual-processing and audio/visual redundancy provides the basic theoretical foundations underlying the comprehension of multiple channel messages; however, investigation of the principle of encoding specificity provides might provide further insight for differences between specific recognition questions. In broad terms the principle of encoding specificity states that retrieval depends on the way in which the information was stored (Tulving & Thomson, 1973). In a stricter sense the principle of encoding specificity posits that what is stored about the occurrence of an experimental stimulus includes information about the specific encoding context existing during original learning. In clearer terms, the encoded information is not only specific to the stimulus itself, but also to the context in which the stimulus is presented.

Based on the principle of encoding specificity the following predictions were made about performance on verbal, pictorial and combined recognition tests. In relation to the verbal recognition tests, it was predicted that participants presented with verbal information in the subtitles would perform significantly better than participants presented with verbal information in the soundtrack. The reason for this is that the current studies utilize written recognition tests, so if the verbal information is encoded in a written format (i.e. subtitles), then retrieval of the written verbal information should be better than retrieval of the auditory verbal information. It was also predicted that participants would perform better on combined-information recognition tests when the verbal information is presented in the subtitles. The reasoning behind this prediction is consistent with that of the verbal recognition tests. On the contrary, based on the principle of encoding specificity, it was predicted that participants would perform significantly

worse on questions requiring pictorial cues than questions requiring verbal cues. The primary reason for this prediction is that pictorial information is encoded visually and the recognition tests used in the current studies were presented in a written format. If the principle of encoding specificity is in fact correct, then we would also expect performance on the verbal-only questions to be better than performance on the combined-information questions, because combined-information questions require the use of verbal and pictorial information in order to render a correct response.

Subtitling Research

Attention: Eye-Movement Research

Although the previously discussed research provides the primary theoretical foundation for the current studies, specific subtitling experiments must also be considered. The majority of the previous subtitling studies have involved the investigation of eye movement patterns while viewing subtitled media and most of those studies originated from Gery D'Ydewalle's lab at the University of Leuven in Belgium. Belgium is a great venue to conduct subtitling research, because there are three different languages native to Belgium: Dutch, French and German. The diversity of native languages among Belgians results in many television programs and movies containing both Dutch and French subtitles, each on a separate line.

Prior to explaining specific experimental procedures utilized to conduct subtitling research, it is important to understand the cognitive nature of subtitles. D'Ydewalle, Van Rensbergen and Pollet (1987) conducted a study to gain better insight into the optimal presentation time of subtitles. Subtitling currently has a standard presentation time, known as the 6-second rule, which is based on a two-line subtitle (double subtitle) with a maximum of 64 characters and spaces presented for 6 seconds. In order to determine why this became the

standard, D'Ydewalle et al. (1987) presented native Belgians with a television series with two-line subtitles presented for either 4, 6 or 8 seconds. Observers were asked to immediately respond to whether the presentation time of the subtitles was too short, sufficient, or too long. The results showed a preference for the 6-second presentation time, consistent with the standard of subtitling (D'Ydewalle et al., 1987). It was suggested that perhaps the reason for this was that observers were used to seeing subtitles presented for a 6-second duration, so it was natural for them to prefer subtitles presented for 6-seconds. Another explanation dealt with the nature of reading the subtitles opposed to listening to the soundtrack. This explanation suggests that reading subtitles is more efficient than listening to the soundtrack, because observers are able to read the subtitles faster than they can comprehend the actual words being spoken during the soundtrack (D'Ydewalle et al., 1987).

Based on the assumption that reading subtitles is a more efficient technique for processing verbal information than listening to the subtitles, it was predicted that participants presented with the native language subtitles in the soundtrack would perform significantly better on verbal recognition tests compared to those who receive the native language in the soundtrack. Additionally, if processing native language subtitles is more efficient than processing native language soundtracks, then participants observing movies only containing their native language in the subtitles should perform better on combined-information questions than participants observing movies with native language soundtracks only. The second prediction was not explicitly tested by D'Ydewalle et al. (1987, 1991); however, if subtitles are in fact more efficiently processed, then more cognitive resources should be available for the processing and integration of pictorial information.

While the previous experiment suggested the most effective presentation time of subtitles, another experiment investigated whether the 6-second presentation time was dependent on the prior experience with subtitled television. In order to investigate this question, D'Ydewalle, Praet, Verfaillie and Van Rensbergen (1991) utilized American and Dutch students. The American students were selected because most television and movies in the United States are in English and most foreign films are dubbed, so they have a limited exposure to subtitles compared to Dutch students. In the first experiment, American students were either presented with a movie containing an English soundtrack with English subtitles or the same movie with no soundtrack and English subtitles. The second experiment involved a similar method as the first experiment; however, in this experiment Dutch-speaking students viewed a Dutch movie. Experimenters monitored the students' eye movements to determine the proportion of attention allotted to the subtitles and the picture. Researchers hypothesized that if American students exhibited reading behaviors associated with the subtitles, then the preference for the 6-second rule would not be attributed specifically to prior extensive exposure to subtitles by Dutch viewers. The results showed similar behavior by both groups where all students focused at least one third of their attention to subtitles, regardless of the differences in soundtracks (D'Ydewalle et al, 1991). Based on these findings, we can assume the reasoning behind the 6-second subtitle duration is related to the observer's ability to efficiently read subtitles.

Further support of visually attending to subtitles can be seen in the study of D'Ydewalle and De Bruycker (2007). For this study twelve Dutch-speaking adults (ages 19-24) and eight Dutch-speaking children (grade 5-6) were presented excerpts from a Swedish cartoon movie, "Pelle Svanslos." Two differing versions were constructed, one with standard subtitling (Swedish soundtrack and Dutch subtitles) and the other with reversed subtitling (Dutch

soundtrack with Swedish subtitles). Participants' eye movements were recorded using the Eye-link eye-tracking system. The dependent measures included: percentage of skipped subtitles, latency times, percentage time in subtitles, fixation duration, word fixation probability, saccade amplitude, percentage of regressive eye-movements, and number of back and forth shifts (D'Ydewalle & De Bruycker, 2007). The percentage of skipped subtitles was 4% for standard subtitles and 21% for reversed subtitles, which is not surprising due to the fact the subtitles in reversed subtitles are in a foreign language. The latency times referred to the time elapsed from the onset of the subtitles until attention was directed toward the subtitles. Results indicated observers presented with standard subtitles had an average latency period of 362ms opposed to 513ms for reversed subtitles. Participants spent an average of 41% of their time attending to subtitles in the standard subtitle condition, whereas they only spent an average of 26% in the reversed subtitle condition (D'Ydewalle & De Bruycker, 2007). In relation to the duration of fixation on subtitles, a difference arose between adults and children, where children fixated on the subtitles an average of 254ms opposed to 186ms for adults. The standard subtitling condition also exhibited a greater probability of fixation (.91) compared to the reversed subtitle condition (.59). Based on these results, we can see the differences in attention given to native versus foreign language subtitles (D'Ydewalle & De Bruycker, 2007). Despite the relative lack of attendance to foreign language subtitles, there is still a chance of some foreign language acquisition when presented with standard subtitling of foreign films.

The results of D'Ydewalle & De Bruycker (2007) indicate that observers attend to subtitles regardless of whether or not they are interpretable, which suggests that people may have a predisposed preference for reading verbal information. If this is the case, then one could assume that this preference for reading verbal information, even when it is presented in a foreign

language, might distract observers from attending to and comprehending the relevant verbal information presented in the soundtrack. Based on this assumption, it was predicted that the presence of foreign language soundtracks would interfere with participants' ability to properly encode relevant verbal information in a familiar language in the soundtrack, resulting in a reduction in recognition performance.

The seemingly automatic reading response noted in the D'Ydewalle & De Bruycker (2007) may be analogous with the phenomenon known as the Stroop Effect. The original Stroop task involves the presentation of a list, each containing the names of colors written in a different color. For instance, the color name 'blue' might be written in red ink. The Stroop Effect specifically refers to observers requiring longer processing time to name the ink color as opposed to reading the color name. For example, it would take an observer longer to respond with the ink color red than to read the word blue. The explanation provided by Stroop is that people are hindered by an automatic reading response, which they must overcome in order to correctly identify the color of ink in which the word is written (Stroop, 1935). If observers do adhere to the automatic reading response posited by Stroop, then we would expect to see a distraction effect associated with presentation of native language, and perhaps also foreign language, subtitles. Specifically, if observers automatically read the subtitles, then their attention is being drawn away from the processing of the native language soundtrack, resulting in a decrease in recognition performance.

Influence of Unattended Sounds

Although the eye tracking studies provide a general understanding what visual stimuli people attend to while viewing subtitled media and suggest a preference for reading subtitles over listening to soundtracks, further discussion is required to gain a complete understanding of

the effect attention has on comprehension of verbal messages. Martin, Wogalter and Forland (1988) conducted a series of studies to investigate the influence of unattended sounds on reading comprehension. In these studies participants were instructed to read a written passage, taken from a practice Graduate Requisite Examination (GRE), then answer multiple-choice questions related to the passage. In order to study the influence of unattended background sounds on reading comprehension, different background sounds were presented while the participants read the passages. The background sounds included a meaningful speech unrelated to the passage, unmeaningful speech (i.e. random words not comprising sentences), instrumental music with no lyrics, and music with lyrics, white noise, a spoken foreign language, or quiet. Results indicate that the presence of any background sounds reduced performance on the reading comprehension task; however, meaningful unattended speech was the most disruptive. Results also showed that exposure to a spoken unfamiliar foreign language (i.e. Russian) significantly disrupted performance on reading comprehension tasks relative to quiet. Martin et al. (1988) concluded that the disruption on reading comprehension tasks is due to attention being captured by irrelevant speech, with greater disruption caused by stimuli more closely related to the reading comprehension task. Based on the findings of these experiments it is predicted that the presentation of a foreign language soundtrack with English subtitles will significantly decrease performance of participants on verbal-only and combined-information recognition questions relative to the presentation of no soundtrack with English subtitles.

Foreign Language Acquisition

Although D'Ydewalle and De Bruycker (2007) found a relative lack of attention given to foreign language subtitles compared to native language subtitles, there is still some evidence in support of foreign language acquisition among viewers of foreign language subtitles.

D'Ydewalle and Van de Poel (1999) conducted a study involving 327 children in grades 3-6 from a primary school in Dutch-speaking Belgium. In order for children to be in 3rd grade of the primary school they must be fluent in reading and writing their native language, in this case Dutch. Participants were presented with a 10-minute still-motion movie involving successive static pictures (i.e. a slide show) to ensure attention would be given to the story and text. Four experimental conditions were used in this experiment including: Dutch subtitles and French soundtrack, French subtitles and Dutch soundtrack, Dutch subtitles and Danish soundtrack, and Danish subtitles and French soundtrack. The control condition contained a Dutch soundtrack with Dutch subtitles (D'Ydewalle & Van de Poel, 1999). Three tests were used to determine foreign language acquisition, including: a vocabulary test (containing an oral and written section), a syntax test and a sentence morphology test. Results indicate language acquisition effects for Danish in all age groups when Danish was available in the soundtrack for both the written and oral vocabulary sections; however, acquisition effects were only evident in the written section of the vocabulary test when Danish was presented in the subtitles. On the other hand, no acquisition effects were observable for French, except when on the oral vocabulary test when French was in the soundtrack. These results may be due to the fact there is a closer etymological relation between Dutch and Danish than between Dutch and French. This make sense because while living in Belgium participants probably heard more French than Danish, even though Danish looks more like Dutch. Results for the syntax and sentence morphology test showed no significant acquisition despite the availability of either foreign language (D'Ydewalle & Van de Poel, 1999).

Another study involving the foreign language acquisition among children through television was conducted by Koolstra and Beentjes (1999). In this experiment 125 boys and 121

girls, grades 4-6, from primary schools in the Netherlands were presented with a 15-minute episode of the American documentary, "The New Wilderness." Three weeks prior to the experimental testing students participated in an English proficiency test in order to determine their previous knowledge of English. Participants were separated into three differing conditions: English soundtrack with Dutch subtitles, English soundtrack with no subtitles, and Dutch soundtrack with no subtitles. Upon completion of the movie clips, participants were given an English matching vocabulary test, an English multiple-choice vocabulary test, and a 30-word auditory recognition test (Koolstra & Beentjes, 1999). Results indicate the children who viewed the English soundtrack program with the Dutch subtitles performed the best on all of the tests. This led to the conclusion that partial language acquisition occurs when foreign language television programs are presented with native language subtitles. They also found a slight increase in foreign language acquisition for children in the English with no subtitles condition; however, this finding was not significant (Koolstra & Beentjes, 1999).

Disadvantages of Subtitles

The efficient nature of subtitles may be an effective way to obtain pertinent information related to the scene; however, the use of subtitles also has several disadvantages relative to the soundtrack. There are three sets of disadvantages associated with the use of subtitles, discussed by Koolstra, Peeters and Spinhof (2002). The first set includes condensation, conciseness and adjustment in speech duration. The process of condensation involves the challenge of reducing the original spoken texts without leaving out information that is essential for the viewers' understanding (Koolstra et al., 2002). Though some information may be lost through the process of condensing, other information may become clearer as well. Making the subtitles concise may result in a better understanding of the information, because less information results in more

efficient mental processing. The final problem dealing with the adaptation of the verbal information provided visually refers to the adjustment of speech duration. When viewing subtitled movies, observers frequently encounter a situation where the character's speech is longer than the subtitled material (Koolstra et al., 2002). The reason behind this is many languages differ in the duration of speech for certain sayings, so the subtitled information may not be able to match with the lip movements and in fact is often abridged from the soundtrack.

Schilperoord, de Groot and van Son (2005) conducted an analysis to examine the effect of captioning television programs on relational coherence. Three Dutch programs (*Oppassen!*, *Hertenkamp*, and *Zembla*) were analyzed in terms of the relational coherence differences between the soundtrack and captions. A total of 185 coherence relations were identified within the soundtracks of the programs. Results show that of the 185 coherence relations identified, only 77 (41.6%) fully survived captioning (Schilperoord et al., 2005). The remaining 108 coherence relations were changed during the creation of the captions. The most common change associated with captioning was the deletion of a causal marker. Deletion of a causal marker refers to one of the sentences in the coherence relation being partially deleted, which in turn changes the meaning implied by the relation (Schilperoord et al., 2005). Results of this study show the problem associated with creating captions or subtitles because the meaning of sentences can be changed through condensation. This analysis also exemplifies how condensation can effect coherence relations between sentences, which may portray an incorrect meaning of the content.

The second set of disadvantages discussed by Koolstra et al. (2002) deals with the issue of omitting parts of the original picture or sound. Redundancy, manipulation and censorship, and limited view are the three specific types of omission. Redundancy only really plays a role

when the viewer is familiar with both the language of the soundtrack and the subtitles. In this case the viewer would receive both the oral and text information, so the information may become redundant; however, the information in the soundtrack and subtitle may not completely match. In certain situations where direct translations are not available, a subtitler must change the subtitled information. This may also occur in a situation of censorship where the content is briefly changed in order to make the movie more palatable in a certain cultural context (e.g. making the language less offensive). The final issue related to the omission of information deals with the location of the subtitles on the screen. Subtitles are commonly displayed on the bottom of the screen and in order to incorporate them a section of the pictorial information must be partially occluded (Koolstra et al., 2002). Though in most cases, critical visual content is not substantially obscured by the subtitles, there are still cases where pertinent visual information may be partially masked by the subtitles.

The last set of disadvantages of subtitle use refers to the fact that the captions are read and listened to simultaneously by viewers (Koolstra et al., 2002). The first specific issue deals with the potential for pictorial information to be missed while the observer is attending to the subtitles. Though this has never been empirically documented, the potential still lingers; however, research does support the idea of substantial automatic switching of attention between the picture and subtitles (D'Ydewalle et al., 1987). A related issue exists in cases where the viewer understands the language of the subtitles, but not the soundtrack. If viewers must rely on subtitles to comprehend the information from a movie or television program, then the observers must focus their visual attention strictly on the program. This strict focus of attention greatly limits the viewer's ability to engage in other activities while watching the movie. On the other hand, if the viewer were also able to comprehend the soundtrack, then they could listen to the

program while performing some unrelated task concurrently. The final disadvantage discussed in this section refers to the issue of mental effort. In many instances viewers of television or movies are simply relaxing and enjoying the entertainment associated with the moving picture. When the viewers are forced to read subtitles in order to understand the movie, they are required to exert more mental effort than viewers who merely comprehend the soundtrack (Koolstra et al., 2002). Increased mental effort may act as a deterrent in some cases, where the viewer merely desires to watch a movie for relaxation, consequently resulting in less information being retained and comprehended. The increased attentional demand on mental processing offers a potential explanation for why many Americans do not like watching foreign films.

The disadvantages of subtitles might not only be related to the omission of information or the presentation of misinformation, but also to the fact that the use of subtitles may sometimes result in cognitive overload. In order to gain a greater understanding of the potential for cognitive overload, an observer must refer to the cognitive load theory. Kalyuga, Chandler and Sweller (1999) explain cognitive load theory in terms of presented information and activities being structured to eliminate any avoidable load in working memory and to maximize the acquisition of new schemas. While this may sound simple, in the case of a subtitled movie, there are several differing inputs which must be managed in order to maximize the acquisition of new schemas. This is especially worrisome because the newly acquired schemas may be limited to certain aspects of the movie due to the loss of pictorial information from subtitle use. For example, suppose the character in a film is reading a map, which they are holding at the bottom third of the screen and during this scene the character is also conversing with others. In this case the observer may miss important information printed on the map because the subtitles partially occlude their view of the map.

Current Studies

Throughout this discussion, various theories have been presented related to the underlying factors associated with the processing of multiple-channel inputs. Although there would seem to be a logical connection between dual-processing theories and the use of subtitles in television and movies, little research has specifically investigated this relationship. Based on the findings of the previously discussed research, two studies investigated the effects of subtitling on the comprehension of movies. Based on the dual-processing research, there were several research questions investigated in the present studies: Will observers presented with information in two different modalities (soundtrack and subtitles) concurrently show greater retention of verbal content than observers receiving verbal information in a single-modality? Will observers presented with only pictorial information or observers presented with only auditory information possess a greater understanding of movie content?

Additionally, several research questions related to the introduction of a foreign language were also considered in the current studies: Do foreign language subtitles affect performance on recognition memory tasks for a movie presented with a native language soundtrack? Finally, is recognition memory better when the native language is presented in the soundtrack or in the subtitles? The purpose of the first study was to determine which combination of native language soundtrack and native language subtitles is the most effective for recognition of movie content. In contrast, the purpose of the second experiment was to determine which combination of soundtrack and subtitles yields the highest comprehension of movie content when a foreign language and native language are presented.

To extend previous research on the comprehension of messages presented in television or movies, the current studies employed a more systematic investigation of the pictorial and verbal

content. Specifically, the current studies individually assessed retention of information only in the verbal message (e.g. soundtrack or subtitles), information only in the pictorial content, and information in both the verbal and pictorial channels.

Please note that throughout the discussion of the two experiments the letters E, N and F will be used to abbreviate the conditions. E refers to the English language, N refers to no language or the absence of language, and F refers to the French language. Furthermore, the letters will appear in pairs and the position of the letter in the pair will indicate the modality in which the language is presented. The first letter in the pair represents the language of the soundtrack (auditory modality) and the second letter in the pair represents the language in the subtitles (visual modality). An example of an abbreviation could be EN, where the E refers to the English language and its location in the first position refers to the soundtrack; therefore, the soundtrack for this condition would be English. The N stands for no language and the location of the N refers to the subtitles, so this particular condition would have no subtitles present. Overall, the condition would be referred to as English soundtrack with no subtitles.

CHAPTER 2 - Experiment 1

In this study, participants observed two ten-minute movie clips, where the presentation format was varied in terms of the verbal information in the soundtrack and subtitles. Specifically, the presentation formats used in Experiment 1 involved an English soundtrack with no subtitles (EN), an English soundtrack with English subtitles (EE), no soundtrack with English subtitles (NE), or no soundtrack with no subtitles (NN).

Hypotheses

RH1: Predictions about verbal-only questions

RH1a: Consistent with the finding that subtitles are more efficient than soundtracks at conveying verbal information (D'Ydewalle et al., 1987, 1991), it was hypothesized that participants in the NE condition would perform significantly better than all other conditions on verbal-only recognition tests, regardless of movie type. In conjunction with the finding that reading subtitles is more efficient than listening to the soundtrack, the principle of encoding specificity suggests that retrieval of verbal information for a written recognition task will be greater when the verbal information is encoded in a written format as opposed to auditory format (Tulving et al., 1973). This hypothesis was also based on the fact that the subtitles shown in the movie clips are generally a slightly condensed version of the soundtrack (Koolstra et al., 2002), and such minor discrepancies between the soundtrack and subtitles may result in an overload of processing capacity in the EE group (Lang, 1995).

RH1b: Despite the potential for processing capacity overload discussed in the previous hypothesis, it was hypothesized that participants in the EE condition would perform significantly

better than participants in the EN condition on verbal-only recognition tests. This hypothesis was based on the assumption that the efficiency associated with the processing of subtitles in the EE condition would compensate for the minor discrepancies between soundtrack and subtitles. Also, the presence of the written verbal information in the subtitles for the EE condition should result in greater retrieval of verbal information for a written recognition test as posited by the principle of encoding specificity.

RH1c: Finally, it was hypothesized that participants in the all other conditions would perform significantly better than participants in the NN condition on verbal-only recognition tests, because the NN condition was the only condition in which neither modality contained verbal information.

RH2: Predictions about combined-information questions

RH2a: Consistent with hypothesis 1a, it was hypothesized that participants in the NE condition would perform significantly better than all other conditions on combined information recognition tests. The reasoning behind this hypothesis is based on the findings of D'Ydewalle et al. (1987, 1991), where verbal information is more efficiently processed by reading subtitles than listening to soundtracks and the principle of encoding specificity (Tulving et al., 1973). Additionally, if the assumption by Lang (1995) that pictorial information requires little cognitive effort to encode is correct, then the incorporation of the pictorial information with the verbal information should be relatively effortless.

RH2b: Consistent with hypothesis 1b, and for the same reasons it was hypothesized that participants in the EE condition would perform significantly better than participants in the EN condition on combined information recognition tests. In accordance with hypothesis 2a, the assumption of little cognitive effort required for encoding of pictorial information also

influenced the prediction that participants in the EE condition would perform significantly better than participants in the EN condition of combined-information questions.

RH2c: Finally, consistent with hypothesis 1c, it was hypothesized that participants from all other conditions would perform significantly better on combined information recognition tests compared to participants in the NN condition.

RH3: Predictions about pictorial-only questions

RH3a: No significant differences were predicted for performance on pictorial-only questions across the four conditions conditions. This hypothesis was based on the findings of Lang (1995), where little processing capacity was required to retain pictorial information, resulting in little or no difference between single- and multi-channel presentations. Lang (1995) also claims that processing of pictorial information is considered automatic, which may explain the lack of capacity required to retain pictorial information. Although Mayer and Moreno's dual-process theory would suggest that participants in the NN condition would perform significantly better than all other conditions of pictorial-only questions, the evidence provided by Lang (1995) provides a better theoretical framework within the context of subtitled media.

RH3b: Also, pictorial-only questions were hypothesized to yield the highest recognition scores compared to the other question types, regardless of condition. This hypothesis was based on Lang's (1995) assumption that encoding of pictorial information requires few cognitive resources. Additionally, pictorial information is assumed to be encoded twice, resulting in a greater probability of the pictorial information being encoded in comparison to the verbal information. If these assumptions are correct, then performance on the pictorial-only recognition tasks should be higher than performance on verbal-only and combined-information questions.

RH4: Predictions about movies

Based on the criterion associated with the selection of the two movie clips, discussed below, the following predictions were made. It is important to note that previous research has not investigated how comprehension of subtitled media differs across movie genres. Given the lack of previous research on specific movie genres, we decided to probe any obtained differences post hoc and determine whether or not theoretical explanations could be derived.

RH4a: The movie clip from A Few Good Men was primarily a verbally-based courtroom scene and lacked significant action, whereas the movie clip from See No Evil, Hear No Evil involved a great deal of action commonly associated with slapstick comedies. Based on the high amount of engaging verbal information associated with A Few Good Men, it was predicted that participants would perform significantly better on verbal-only questions for A Few Good Men than verbal-only questions for See No Evil, Hear No Evil. Despite the fact that this prediction is not based on previous theoretical evidence, we presumed that the high level of action associated with See No Evil, Hear No Evil would distract participants from attending to the verbal information.

RH4b: Additionally, based on the difference in action content it was hypothesized that participants would perform significantly better on questions involving pictorial information (i.e. pictorial-only and combined-information questions) for See No Evil, Hear No Evil compared to A Few Good Men. Although this prediction is not contingent upon a specific theoretical framework, the lack of action within the movie A Few Good Men was presumed to result in a lack of attendance to the pictorial information.

Method

Participants

200 undergraduate students from Kansas State University, enrolled in a General Psychology course, participated as part of their course requirement. Participants were randomly assigned to one of four experimental conditions: English soundtrack with English subtitles (EE), English soundtrack with no subtitles (EN), no soundtrack with English subtitles (NE), or no soundtrack with no subtitles (NN).

Materials and Apparatus

Two ten-minute movie clips from two 1980's movies were presented with the differing variations of soundtrack and subtitles, noted in the previous paragraph. The movie clips include a courtroom scene from the dramatic film A Few Good Men and a compilation of two scenes from the comedy film See No Evil, Hear No Evil. The scenes were selected based on four criteria related to content. The first selection criterion was to choose movies that were not likely to have been previously and recently viewed by the participants. Generally, the majority of the students in General Psychology courses at Kansas State University are 18 or 19 years of age, so selecting movies from the 1980s greatly reduced the prevalence of previous viewings. The second criterion was to select movies which differed in terms of tempo or pacing of the events. See No Evil, Hear No Evil has a fast-paced, slapstick humor feel and A Few Good Men is a slow progressing, serious scene with almost no action. Another key difference between the movies is the number of characters in the scene; See No Evil, Hear No Evil contains interaction with a greater number of extras than A Few Good Men. The final criterion for selection was finding an action-based movie (See No Evil, Hear No Evil), where a viewer could understand a good portion of the content by observing pictorial cues derived from physical actions and a verbal-

based movie (A Few Good Men), where the viewer must rely almost entirely on auditory or subtitle cues from the dialogue to understand the content.

For each participant, the paper and pencil materials consisted of a 30 multiple-choice question comprehension test for each movie clip (see Appendices 1 & 2) and a demographic questionnaire (see Appendix 3). Each comprehension test contained 10 questions from each of three question types based on the information from different modalities needed to correctly answer each question. Questions appeared in a random but consistent order for all participants. Pictorial-only questions required only the use of pictorial cues, from the scene, to answer correctly. The information needed never appeared in the soundtrack or subtitles. An example of a pictorial-only question from the movie See No Evil, Hear No Evil was: "Where did Wally's dart land in relation to the dart board?" The verbal or dialogue-only questions require cues which only appeared in the dialogue (soundtrack and subtitles), but not in the pictorial content. For instance, one of the verbal only questions from A Few Good Men was: "What was the name of the illness developed by the victim that led to his death?" The final type of question dealt with combined information, where the viewer must draw information from pictorial and verbal cues in order to correctly answer the question. An example of a combined question from See No Evil, Hear No Evil was: "What time said by David resulted in the first punch being landed by Wally?" Questions were pilot tested in order to ensure they were of appropriate difficulty, relevant to the specific scenes and to confirm that the questions were appropriately assigned to one of the three question types. The demographic questionnaire assessed the gender, age, year in school of the students and also contained questions related to previous viewings of the movies used in the experiment (See Appendix 3).

Procedure

Participants were tested in group sessions consisting of 10-15 persons. Each session was randomly assigned to one of the four conditions: English soundtrack with no subtitles (EN), English soundtrack with English subtitles (EE), no soundtrack with English subtitles (NE), or no soundtrack with no subtitles (NN). The randomly assigned condition determined the variation of the soundtrack and subtitles presented to the participants. The soundtrack and subtitle variation remained constant for both movie presentations in a given session.

Once randomly assigned a condition, participants were escorted into the experimental room, welcomed, and asked to sit in the first three rows. Participants were then informed that the purpose of the study was to investigate the relationship between people's viewing pleasure and the use of subtitles in movies. Following completion of the informed consent forms, participants were shown the first of two ten-minute movie clips on a 27-inch television screen. Again the order of the movie clips was counterbalanced to control for practice effects. Once the presentation of the first movie clip was complete, participants were asked to complete the comprehension test which corresponded to that scene. The second movie clip was shown immediately after all comprehension tests were collected from the first movie. The second and final comprehension test was presented following the viewing of the second movie clip. After participants had completed the second comprehension test, they received the demographic questionnaire. Upon completion of the demographic questionnaire, participants were debriefed about the purpose of the experiment in greater detail and given the opportunity to ask questions related to the material. Finally the participants were thanked for their participation and dismissed. The experimental procedure took approximately 45 minutes from welcome to dismissal.

Data Analysis

A 2x2x2x3 mixed-factorial MANOVA compared performance on the comprehension tests across conditions. Orthogonal variations of soundtrack and subtitles yielded four different presentation formats, with soundtrack and subtitles constituting the between-subjects independent variables. The presentation formats included an English soundtrack with English subtitles (EE), an English soundtrack with no subtitles (EE), no soundtrack with English subtitles (NE), and no soundtrack with no subtitles (NN). The within-subjects variables consisted of the two movie clips as levels of one independent variable and the three question types as levels of the other within-subjects independent variable. Questions about previous viewings of each movie were used as covariates during analysis to identify any difference in performance on the recognition tests due to prior exposure to the movies. Simple effects analyses were used to further probe the significant interactions across independent variables.

Note: the order in which the movies were presented (AB or BA) was included in an initial 2x2x2x3x2 mixed factorial MANOVA to determine the influence of practice effects. Interaction effects involving order yielded no significant trends that suggested the presence of practice effects. In particular, there was no main effect of order and no order by movie interaction, which would have suggested a practice effect. The order of the movies was counterbalanced to account for practice effects and was not related to any specific hypotheses. Based on these observations, no analyses related to the order variable were reported.

Results

The 2x2x2x3 mixed-factorial MANOVA showed a between-subjects main effect of soundtrack, $F(1, 49)=86.15$, $p<.001$, partial $\eta^2= .305$. Comparisons of the marginal means revealed presentation formats containing English soundtracks (6.58) performed significantly

better overall than participants who viewed a presentation format with no soundtrack (5.30). There was also a between-subjects main effect of subtitles, $F(1,49)=132.94$, $p<.001$, partial $\eta^2=.404$. The overall marginal means showed that presentation formats containing English subtitles (6.73) yielded significantly better performance on recognition tests overall compared to presentation formats with no subtitles (5.14). Results from the repeated measures MANOVA also revealed a significant within-subjects main effect of movie, $F(1, 49)=8.61$, $p<.01$, partial $\eta^2=.042$, with participants performing significantly better on questions related to A Few Good Men (6.06) than questions related to See No Evil, Hear No Evil (5.82). Additionally, results showed a within-subjects main effect of question type, $F(2, 49)=205.34$, $p<.001$, partial $\eta^2=.512$. Contrary to hypothesis 3b, pairwise comparisons of the overall means indicated that participants performed significantly better on the verbal-only (6.80) question type than the combined-information (6.32) question type and the combined-information question type yielded better performance than the pictorial-only (4.69) question type (see Table 1).

There was a significant two-way interaction between soundtrack and subtitles, $F(1, 49)=93.01$, $p< 001$, partial $\eta^2=.32$, where participants in the English soundtrack with English subtitles condition (6.71), no soundtrack with English subtitles condition (6.76) and English soundtrack with no subtitles condition (6.45) performed significantly better overall on the recognition tests compared to participants in the the no soundtrack with no subtitles condition (3.84). No difference was found between the English soundtrack with English subtitles condition, the no soundtrack with English subtitles condition and the English soundtrack with no subtitles condition on overall recognition performance. See Table 1 for overall marginal mean scores on recognition scores.

Analyses also revealed a significant two-way interaction between soundtrack and question type, $F(2, 49)=30.47$, $p< 001$, partial $\eta^2=.14$, with the conditions containing an English soundtrack (V=7.78, C=7.10) performing significantly better on the verbal-only and combined information question types than the conditions containing no soundtrack (V=5.82, C=5.54). No difference was found between soundtrack presentations on pictorial-only questions (E=4.86, N=4.53).

There was also a significant two-way interaction between subtitles and question type, $F(2,49)=104.02$, $p<.001$, partial $\eta^2=.35$, where conditions containing an English subtitles (V=8.23, C=7.36) performed significantly better on the verbal-only and combined-information question types than conditions containing no subtitles (V=5.37, C=5.29). Consistent with the soundtrack by question type interaction, the difference between conditions with English subtitles and conditions with no subtitles on pictorial-only questions (E=4.61, N=4.78) was not statistically significant.

Additionally, there was a significant two-way interaction between question type and movie, $F(1, 49)=34.93$, $p<.001$, partial $\eta^2=.151$. Comparison of the overall marginal means revealed that participants performed significantly better on pictorial-only questions for A Few Good Men (5.24) than pictorial-only questions for See No Evil, Hear No Evil (4.15). Additionally, participants performed significantly better on combined-information questions for See No Evil, Hear No Evil (6.61) than combined-information questions for A Few Good Men (6.03). No significant difference was found between movies on verbal-only questions (A=6.90, S=6.70).

Results also indicated a significant three-way interaction between soundtrack, subtitles and question type, $F(2, 49)=37.87$, $p<.001$, partial $\eta^2=.162$. Simple effects analyses were conducted to further probe the three-way interaction effects.

A review of the influence of the covariates showed a significant interaction between prior exposure to A Few Good Men and movie type, $F(2, 49)=14.89$, $p<.001$, partial $\eta^2=.07$. Results indicated that participants who had watched A Few Good Men (N=61 out of 200) prior to the experiment performed significantly better on questions for A Few Good Men than participants with no prior exposure. Prior exposure to See No Evil, Hear No Evil (N=12 out of 200) revealed no significant interactions, suggesting that prior exposure to this film did not influence performance on the recognition tasks.

Soundtrack by Subtitles by Question Type Simple Effects

Consistent with hypothesis 1b, EE participants performed significantly better on verbal-only questions than EN participants, $F(1, 49)=10.03$, $p<.05$ and NN participants, $F(1, 49)=489.62$. Participants in the NE condition also performed significantly better on verbal-only questions than EN participants, $F(1, 49)= 17.45$, $p<.05$ and NN participants, $F(1, 49)=535.33$, $p<.05$. Additionally, EN participants performed significantly better on verbal-only questions than NN participants, $F(1, 49)=359.47$, $p<.05$. In contrast to the prediction in hypothesis 1a, NE participants did not perform significantly better than EE participants on verbal-only questions (see Table 1). Contrary to hypothesis 3a, simple effects showed EN participants performed significantly better on pictorial-only questions than EE participants, $F(1, 49)=4.66$, $p<.05$; NE participants, $F(1, 49)=5.06$, $p<.05$; and NN participants, $F(1, 49)=8.36$, $p<.05$. No significant differences were found between EE, NE and NN participants on pictorial-only questions (see Table 1). Consistent with hypothesis 2b, participants in the EE condition performed significantly

better on combined-information questions than EN participants, $F(1, 49)=6.61$, $p<.05$ and NN participants, $F(1, 2)=277.70$, $p<.05$. Additionally, consistent with hypothesis 2a, participants in the NE condition performed significantly better than EN participants, $F(1, 2)=5.48$, $p<.05$ and NN participants, $F(1, 2)=270.10$, $p<.05$ on combined-information questions. EN participants also performed significantly better than NN participants, $F(1, 2)=198.63$, $p<.05$ on combined-information questions (see Table 1). In contrast to the prediction of hypothesis 2a, there was no significant difference between EE and NE participants on combined-information questions.

Discussion

The results of Experiment 1 revealed that presentation format significantly influenced performance on the recognition tests. Specifically there was a main effect of soundtrack and a main effect of subtitles both suggesting that the presence of the English language as opposed to the absence of language in each modality significantly increased performance on the recognition memory tests. Although these results intuitively make sense, comparison of the overall marginal means for the two-way interaction of soundtrack by subtitles revealed that poor performance by participants in the no soundtrack with no subtitles condition likely caused both main effects (See Table 1). The poor overall performance on the recognition tests by participants in the no soundtrack with no subtitles condition is not surprising because two of the three question types required verbal information in order to correctly answer and the no soundtrack with no subtitles condition was not provided any verbal information. Based on this observation further analysis was required to determine specific differences between the presence and absence of the English language in the soundtrack and subtitles.

In order to better understand the differences between the presentations of soundtrack and subtitles, simple effects analysis was used to probe the three-way interaction of soundtrack by

subtitles by questions type. The comparison of soundtrack by subtitles by question type was of particular interest because many of the predictions made were based on these findings. Results from the simple analysis showed that presentation formats containing the verbal information in the subtitles (i.e. EE and NE) yielded significantly higher scores on the verbal-only and combined-information questions than presentation formats containing no subtitles (i.e. EN and NN). Although the comparison of the EE and NE conditions revealed no significant differences for verbal-only or combined-information questions, the fact that both presentation formats containing English subtitles yielded better performance than the EN condition suggests superiority for verbal information presented visually. This result is consistent with the previous findings of D'Ydewalle et al. (1987, 1991), suggesting that reading the verbal information from the subtitles is more efficient than listening to the soundtrack. Additionally, this is consistent with Tulving and Thomson's (1973) principle of encoding specificity, because the best performance on written recognition tests, which required the retrieval of verbal information, occurred when the verbal information was presented in the subtitles.

Analyses also revealed that participants from the English soundtrack with no subtitles condition performed significantly better than participants from the no soundtrack with no subtitles condition on verbal-only and combined-information questions, which is not surprising as the no soundtrack with no subtitles condition was not provided with any verbal information from the movie clips.

Comparison of the presentation formats with regards to pictorial-only questions showed that participants in the English soundtrack with no subtitles condition performed significantly better than all other conditions. One potential explanation for the reduced performance on pictorial-only questions for the conditions containing subtitles is that the participants selectively

attended to the verbal information in the subtitles, resulting in the lack of encoding of pictorial information. This finding could also reflect a sort of Stroop Effect, whereby participants experience an automatic reading response when presented with subtitles, so they attend to less of the pictorial information in comparison to the EN condition. In contrast the better performance by EN participants on pictorial-only questions than NN participants is not as easily explained. In contrast to the findings of Mayer & Moreno (1997), participants presented with only pictorial information did not perform better than participants presented with verbal and pictorial information. A possible explanation, based on observations from the experimenters, is that participants in the NN condition lost interest in the movie because they were not presented with any verbal information. Such loss of interest could have resulted in some participants completely removing their attention from the movie. No significant differences were found between EE, NE and NN participants on pictorial-only questions.

Results also indicated a main effect of movie, where performance was significantly better on A Few Good Men questions overall than See No Evil, Hear No Evil questions. This result could be due to the difference in content between the two movie clips. As mentioned earlier, one of the factors considered in the selection of the movies was that the A Few Good Men scene was almost entirely verbally-based and See No Evil, Hear No Evil was more visual-action oriented. Further probing of the differences between movies revealed that performance on the verbal-only questions was marginally greater for A Few Good Men, consistent with hypothesis 4a (A=6.90, S=6.70); and that performance on the combined-information questions was marginally greater for See No Evil, Hear No Evil, consistent with hypothesis 4b (A=6.04, S=6.61). Additionally, contrary to hypothesis 4b, performance on the pictorial-only questions for A Few Good Men (5.24) was significantly better than for See No Evil, Hear No Evil (4.15) questions. Although

these differences might reflect the different modalities, they could also merely reflect differential difficulty levels of the question types for each movie. Probably a more likely explanation for the main effect of movie is that 61 participants (30.5%) had watched A Few Good Men prior to the experiment and the previously exposed participants performed significantly better on A Few Good Men questions than participants who had not seen A Few Good Men prior to the experiment.

Results also showed a significant main effect of question type and comparison of the marginal means revealed that the difference was primarily due to the poor performance on pictorial-only (4.69) questions compared to verbal-only (6.80) and combined-information (6.32) questions. Refer to the General Discussion for further explanation of these results.

The purpose of Experiment 1 was to compare the usefulness of familiar language soundtracks and subtitles for the comprehension of movie scenes. Overall the results of Experiment 1 supported the previous findings of D'Ydewalle et al. (1987, 1991), in which native language subtitles yielded better comprehension than native language soundtracks. Additionally, the results support the principle of encoding specificity. Although Experiment 1 provides a comparison of standard typical movie viewing (i.e. native language soundtrack with no subtitles-EN group) and closed caption presentations (i.e. native soundtrack with native language subtitles-EE group), there was no investigation of subtitled movies involving a foreign language. Building on the results of Experiment 1, a second experiment was conducted to determine the effects of presenting movies containing foreign language soundtracks or subtitles on comprehension.

CHAPTER 3 - Chapter 3: Experiment 2

In this study, participants viewed the same two ten-minute movie clips as in Experiment 1, although the experimental conditions differed. Unlike Experiment 1, this study involved the incorporation of soundtracks and/or subtitles in an unfamiliar language, rather than simply using the participants' native language. The movies were presented in one of the following formats: English soundtrack with French subtitles (EF), French soundtrack with English subtitles (FE), French soundtrack with French subtitles (FF) or no soundtrack with French subtitles (NF).

Hypotheses

RH5: Predictions about Verbal-Only Questions

5a: Consistent with Experiment 1, participants in the FE condition are hypothesized to perform significantly better than all other conditions on verbal-only recognition tests, regardless of movie type. This hypothesis was based on the previous findings of D'Ydewalle et al. (1987, 1991), where reading verbal information in the subtitles led to better message comprehension than only listening to the soundtrack. This hypothesis is also consistent with the findings of Experiment 1 that reflect support for the principle of encoding specificity (Tulving et al., 1973). Since the familiar verbal information was presented in the English subtitles only for presentation format FE, performance was predicted to be higher than in the other three conditions.

5b: Additionally, consistent with Experiment 1, participants in the EF condition would perform significantly better than participants in the FF and NF conditions on verbal-only recognition tests. This prediction is based on the fact that the EF condition presents the viewers with a verbal soundtrack in a familiar language, whereas, the FF and NF conditions do not contain any format in a familiar language.

5c: No significant difference was predicted between FF and NF participants on verbal-only recognition tests. The reason for this prediction is that neither FF nor NF presented participants with verbal information in a familiar language, so performance on verbal-only questions should be around the level of chance.

RH6: Predictions about Combined-Information Questions

6a: Consistent with prediction 4a, and for the same reasons, participants in the FE condition would perform significantly better than all other conditions on combined-information recognition tests.

6b: Consistent with hypothesis 4b, and for the same reasons, participants in the EF condition would perform significantly better than participants in the FF and NF conditions on combined-information recognition tests.

6c: Consistent with hypothesis 4c, and for the same reasons, it was hypothesized that participants in the FF and NF conditions would show no difference in performance on combined-information questions.

RH7: Predictions about Pictorial-Only Questions

7a: No significant differences were predicted for performance on pictorial-only questions across the conditions. This prediction was based on the previous findings of Lang (1995), in which participants performed equally well on pictorial-only questions, regardless of presentation format.

7b: Additionally, scores on the pictorial-only question type were hypothesized to be higher than scores on the verbal-only and combined-information question types. The second prediction was similarly based on the findings of Lang (1995), where pictorial information was found to require few cognitive resources for encoding.

RH8: Predictions for French Vocabulary Tests

8a: Participants in the EF condition would perform significantly better than all other conditions on the French vocabulary tests, regardless of movie. This hypothesis was based on the fact that the English and French languages share many written cognates, but few spoken cognates, so comparison between English and French requires fewer cognitive resources with written French (EF) than spoken French (FE). This prediction is consistent also with the findings of D'Ydewalle & Van de Poel (1999), where Dutch speaking students exhibited significant foreign language acquisition for Danish on a written vocabulary test when the Danish language was presented in the soundtrack. Similar to the French and English languages, the Dutch and Danish languages share many written spoken cognates and fewer spoken cognates.

8b: Additionally, participants in the FE condition would perform significantly better than participants in the FF and NF conditions on the French vocabulary tests, regardless of movie. This prediction was based on the fact that the FE provides the opportunity for viewers to compare the English and French languages, whereas, the FF and NF conditions do not contain both languages.

8c: Finally, no significant differences were predicted for performance on the French vocabulary tests between participants in the FF and NF conditions.

RH9: Predictions about movies

RH9a: The movie clip from A Few Good Men was primarily a verbally-based courtroom scene with little action, whereas the movie clip from See No Evil, Hear No Evil involved a great deal of action. Based on the high amount of verbal information in A Few Good Men, it was predicted that participants would perform significantly better on verbal-only questions for A Few Good Men than verbal-only questions for See No Evil, Hear No Evil. Despite the fact that this

prediction is not based on previous theoretical evidence, we proposed that the high level of action associated with See No Evil, Hear No Evil would distract participants from attending to the verbal information.

RH9b: Additionally, based on the difference in action content it was hypothesized that participants would perform significantly better on questions involving pictorial information (i.e. pictorial-only and combined-information questions) for See No Evil, Hear No Evil compared to A Few Good Men. Although this prediction does not derive from a specific theoretical framework, the lack of action within A Few Good Men was proposed to result in a lack of attention to the pictorial information.

Method

Participants

200 undergraduate students from Kansas State University enrolled in a General Psychology course participated in the experiment as part of their course research credit. As in Experiment 1, participants were randomly assigned to one of four presentation formats. In this case the formats included: English soundtrack with French subtitles (EF), French soundtrack with English subtitles (FE), French soundtrack with French subtitles (FF), and no soundtrack with French subtitles (NF). A single participant, who had more than 2 years of high school study of the French language, was excluded from the data set. The reason for this exclusion was the current study used the French language as an unfamiliar language, so limited experience with the French language was required for participation.

Materials and Apparatus

The same movie clips used in Experiment 1 were again used in Experiment 2; however, the formats in which the movie clips were presented differed. The difference in the presentation

of the movie clips involved the introduction of a foreign language (French). There are three reasons why French was selected to be the foreign language used in this study. First, French is not a common language encountered in the Midwestern United States, making it unlikely that a large number of students would possess extensive experience with the language. The second reason was based on the sharing of cognates between the English and French language. When the English and French languages are spoken, there are relatively few similarities phonologically; however, when presented in a written format English and French share several similar orthographic cognates. With the differences in phonology between spoken English and French, the odds of hearing similar words to English in the French soundtrack were greatly reduced. However, words in the French subtitles may appear more like English words. The final reason was the common availability of English movies which contained French subtitles and soundtracks as viewing options.

The same comprehension tests used in Experiment 1 were also used in Experiment 2 with no differences in format or content. Although the main purpose of the experiment was to determine the effects of foreign language soundtracks and subtitles on comprehension of content, French vocabulary tests were used to monitor the occurrence of incidental foreign language acquisition (see Appendices 4 & 5). The French vocabulary tests were drawn from content words contained within both the soundtrack and subtitles of each scene. Matching tasks were used for each French vocabulary test, where participants were presented with 30 French vocabulary words and instructed to select the English translation from a word bank containing 40 English words. The demographic questionnaire was mostly consistent with Experiment 1, with the addition of questions inquiring about experience with the French language (see Appendix 6). All test materials, except the French vocabulary test, were entirely in English.

Procedure

As in Experiment 1, participants were tested in group sessions of 10-15 persons. Each session was randomly assigned to one of the four conditions: English soundtrack with French subtitles (EF), French soundtrack with English subtitles (FE), no soundtrack with French subtitles (NF), and French soundtrack with French subtitles (FF). Except for the introduction of the foreign language questionnaire after each comprehension test, the method of presentation for the movies and comprehension tests remained the same as Experiment 1. Foreign language questionnaires were completed directly after each comprehension questionnaire.

Data Analysis

A 4x2x3x2 mixed-factorial MANOVA was used to compare performance on the comprehension tests across conditions. The four soundtrack and subtitle formats constituted the levels of one between-subjects independent variable; these included an English soundtrack with French subtitles (EF), an French soundtrack with English subtitles (FE), French soundtrack with French subtitles (FF), and no soundtrack with French subtitles (NF). The order in which the movies were presented was also included as a between-subjects independent variable. The within-subjects variables consisted of the two movie clips and the three question types as the independent variables. Additionally, a 4x2 MANOVA (presentation format x movie) was used to compare performance on the French vocabulary tests across conditions. Questions about previous viewings of each movie were used as covariates during analysis to identify any difference in performance on the recognition tests due to prior exposure to the movies. Simple effects analyses were used to further explore the significant interactions across independent variables.

Note: In Experiment 2 the presentation formats were analyzed as four levels of a single variable, whereas, in Experiment 1 the presentation formats were analyzed as two levels of two variables. The reason for this difference is that, since both experiments used the same materials, specific planned comparisons could be made across the conditions post hoc, so using the EE condition in both experiments seemed counterintuitive. Additionally, the no soundtrack with French subtitles and the French soundtrack with French subtitles presentation formats were selected over the French soundtrack with no subtitles presentation format for the current experiment, because of the presence on French in the subtitles.

Results

Consistent with Experiment 1, the 4x2x3x2 mixed-factorial MANOVA showed a between-subjects main effect of presentation format, $F(3, 49)=74.58$, $p<.001$, partial $\eta^2=.54$. Based on pairwise comparisons of the overall means, FE (5.98) participants performed significantly better overall than EF (4.84), FF (4.02) and NF (3.91) participants. Pairwise comparisons also showed that EF participants performed significantly better than FF and NF participants overall. In contrast to Experiment 1, a between-subjects main effect of order was also revealed, $F(1, 49)=5.17$, $p<.05$, partial $\eta^2=.03$. Pairwise comparisons showed that participants performed modestly but significantly better when presented with <u>See No Evil, Hear No Evil</u> prior to <u>A Few Good Men</u> (4.81) than when the movies were presented in the opposite order (4.56). Additionally, the analysis revealed within-subjects main effects of question type, $F(2, 49)=10.02$, $p<.001$, partial $\eta^2=.05$. Pairwise comparisons of the overall means showed participants performed significantly better on combined-information (4.88) and verbal-only (4.76) questions than on pictorial-only (4.42) questions. A within-subjects main effect of movie, $F(1, 49)=36.82$, $p<.001$, partial $\eta^2=.16$, was also revealed by the analysis. Pairwise comparisons

of the overall means showed that, as in Experiment 1, participants performed significantly better on A Few Good Men Questions (4.96) than See No Evil, Hear No Evil (4.41) questions. Note, that, because of the significant main effect of order, a 4-way MANOVA was used in the second experiment.

There were significant two-way interactions between presentation format and question type, $F(2, 49)=31.17$, $p<.001$, partial $\eta^2=.33$; question type and movie, $F(2, 49)=38.52$, $p<.001$, partial $\eta^2=.17$; and presentation format and presentation order, $F(3, 49)=8.17$, $p<.001$, partial $\eta^2=.11$. Analyses also showed a significant three-way interaction of question type by presentation format by movie order, $F(3, 49)=2.75$, $p<.05$, partial $\eta^2=.04$. Simple effects analyses were conducted to further understand the significant differences between presentation formats. It is important to note that, as in Experiment 1, the current results did not show a significant interaction effect between movie and order. The lack of a significant interaction effect between movie and order implies that performance was not influenced by a practice effect. Since no practice effects were revealed, no further analyses related to the variable order were reported.

Analysis of the covariates revealed no significant influence of prior exposure to the movies. Frequencies analyses showed that 13 participants (out of 200) had watched A Few Good Men prior to the experiment and 10 participants (out of 200) had watched See No Evil, Hear No Evil prior to the experiment.

French Vocabulary Tests

A 4x2 between-subjects MANOVA was used to compare performance on French vocabulary tests across presentation format. Results indicate no significant differences in performance for the French vocabulary questionnaires across presentations formats (see Table 5

for overall means). Participants in all conditions performed very poorly on both French vocabulary tests, approximately 10% correct, and the majority of the correct responses were on terms sharing cognates (e.g. French: membre, English: member). Since no main effects or interactions were revealed, no further analyses were conducted involving French vocabulary scores.

Presentation Format by Question Type Simple Effects

Consistent with hypothesis 5a, simple effects analyses revealed that FE participants performed significantly better on the verbal-only questions than EF, $F(1, 2)=54.17$, $p<.05$; FF, $F(1, 2)=192.31$, $p<.05$; and NF participants, $F(1, 2)=181.27$, $p<.05$. Additionally, consistent with hypothesis 6a, FE participants performed significantly better on combined information questions than EF, $F(1, 2)=37.80$, $p<.05$; FF, $F(1, 2)=154.54$; and NF participants, $F(1, 2)=193.55$, $p<.05$. Simple effects comparisons also revealed that participants in the EF condition performed significantly better than FF participants on verbal-only questions, $F(1, 2)= 42.35$, $p<.05$; and combined-information questions, $F(1, 2)=39.48$, $p<.05$, supporting hypotheses 5b and 6b. Additionally, in support of hypotheses 5b and 6b, participants in the EF condition performed significantly better than NF participants on verbal-only questions, $F(1, 2)=37.25$; and combined-information questions, $F(1, 2)=60.27$, $p<.05$. As predicted in hypotheses 5c, 6c, and 7a, no significant differences were found between FF and NF participants on any question type. Additionally, no significant differences were found across presentation formats on pictorial-only questions, consistent with hypothesis 7a. See Table 2 for overall mean scores on recognition tests by presentation formats.

Movie by Question Type Effects

Comparison of the marginal means and simple effects post hoc revealed higher scores on the verbal-only and pictorial-only questions for A Few Good Men (V=5.42, P=4.80) compared to See No Evil, Hear No Evil (V=4.10, P=4.05). The findings for verbal-only questions were consistent with hypothesis 9a; however, the findings for pictorial-only questions contradicted the hypothesis 9b. On the contrary, scores on combined-information questions were higher for See No Evil, Hear No Evil (5.10) than A Few Good Men (4.70). The findings for combined-information questions were consistent with hypothesis 9b.

Presentation Format by Question Type by Movie Simple Effects

Verbal-Only Questions

Consistent with hypothesis 5a, simple effects analyses revealed that FE participants performed significantly better on verbal-only questions than EF participants for A Few Good Men, $F(1, 49)=23.13$, $p<.05$; and See No Evil, Hear No Evil, $F(1, 49)=43.85$, $p<.05$. In addition, FE participants significantly outperformed FF participants on verbal-only questions for A Few Good Men, $F(1, 49)=106.43$, $p<.05$; and See No Evil, Hear No Evil, $F(1, 2)=125.95$, $p<.05$. Simple effects analyses also showed that FE participants performed significantly better than NF participants on verbal-only questions for A Few Good Men, $F(1, 2)=100.76$, $p<.05$, and See No Evil, Hear No Evil, $F(1, 49)=118.25$, $p<.05$. Consistent with hypothesis 5b, simple effects comparisons between EF and FF participants showed EF participants performed significantly better on verbal–only questions for A Few Good Men, $F(1, 49)=30.32$, $p<.05$, and See No Evil, Hear No Evil, $F(1, 49)=21.17$, $p<.05$. Analysis of simple effects also revealed EF participants performed significantly better than NF participants on verbal-only questions for A Few Good Men, $F(1, 49)=27.33$, $p<.05$, and See No Evil, Hear No Evil, $F(1, 49)=18.08$, $p<.05$. Consistent

with hypothesis 5c, no significant differences were found between FF and NF participants on verbal-only questions, regardless of movie. See Tables 3 & 4 for overall mean scores on recognition types for presentation formats by each movie.

Combined-Information Questions

As predicted in hypothesis 6a, FE participants performed significantly better on combined-information questions than EF participants for A Few Good Men, $F(1, 49)=13.65$, $p<.05$ and See No Evil, Hear No Evil, $F(1, 49)=34.29$, $p<.05$. Additionally, FE participants performed significantly better than FF participants on combined-information questions for A Few Good Men, $F(1, 49)=62.05$, $p<.05$ and See No Evil, Hear No Evil, $F(1, 49)=130.69$, $p<.05$. Simple effects comparisons between FE and NF participants showed FE participants performed significantly better on combined-information questions for A Few Good Men, $F(1, 49)=80.86$, $p<.05$ and See No Evil, Hear No Evil, $F(1, 49)=159.19$, $p<.05$. Simple effects analyses revealed that EF participants performed significantly better than FF participants on combined-information questions for A Few Good Men, $F(1, 49)=17.49$, $p<.05$, and See No Evil, Hear No Evil, $F(1, 49)=31.09$, $p<.05$. Analysis of simple effects revealed EF participants performed significantly better than NF participants on combined-information questions for A Few Good Men, $F(1, 49)=28.06$, $p<.05$, and See No Evil, Hear No Evil, $F(1, 49)=45.72$, $p<.05$. Consistent with the findings for verbal-only questions, there was no significant difference for combined-information questions between the FF and NF presentation formats. See Tables 3 & 4 for mean scores on recognition tests for each movie by condition.

Presentation Format by Presentation Order Simple Effects

Simple effects analysis of interactions involving presentation order yielded no significant trends that suggested the presence of practice effects. Specifically, there was no significant

interaction between presentation order and movie type. The order of the movies was counterbalanced to account for practice effects and was not related to any specific hypotheses. Based on these observations further analyses related to the interaction effects of order were not reported.

Discussion

The results of Experiment 2 revealed that presentation format significantly influenced performance on the recognition tests. Previous research by D'Ydewalle et al. (1987, 1991) found better performance on verbal recognition tasks when the participants were presented with standard subtitles (foreign language soundtrack with native language subtitles) as opposed to reversed subtitles (native language soundtrack with foreign language subtitles). These findings were supported by the results of Experiment 2, where participants in the FE condition performed significantly better overall on the verbal-only and combined-information recognition tests than those in the EF, FF and NF presentation formats (see Table 4). In addition to confirming the finding of Experiment 1 that reading subtitles is more efficient than reading subtitles, the better performance by FE participants is also consistent with the principle of encoding specificity. Results also indicated that EF participants performed significantly better overall than FF and NF participants on verbal-only and combined-information questions. This finding is not surprising, as neither the FF nor NF conditions were provided with verbal information in a language familiar to them.

Unlike Experiment 1, results from Experiment 2 showed a significant between-subjects main effect of presentation order, where participants presented with See No Evil, Hear No Evil prior to A Few Good Men performed better than participants presented with the movies in reverse order, although the effect size was very small. Despite the significant main effect of

presentation order, simple effects analyses revealed no significant trends suggesting practice effects. Since the order of the movies was counterbalanced to account for practice effects and no specific predictions were made regarding order of movies, the variable of order was not investigated or interpreted further.

Results also indicated a within-subjects main effect of movie, as in Experiment 1, with performance significantly better on A Few Good Men (4.96) questions overall than See No Evil, Hear No Evil (4.41) questions. This result could be due to the difference in content between the two movie clips. As mentioned earlier, one of the factors considered in the selection of the movies was the A Few Good Men scene was almost entirely verbally-based and See No Evil, Hear No Evil was more visual-action oriented. Performance on the verbal-only (A=5.42, S=4.10) and pictorial-only (A=4.80, S=4.05) questions was significantly higher for A Few Good Men. On the other hand, performance on combined-information questions (A=4.67, S=5.09) was marginally better for See No Evil, Hear No Evil. Although these differences could reflect the different modalities, they could also merely reflect differential difficulty levels of the movies and/or specific question types for each movie. Contrary to Experiment 1, this finding could not be attributed to the influence of prior exposure to the movie A Few Good Men.

As in Experiment 1, the significant main effect of question type found in Experiment 2 was primarily due to the poor performance on pictorial-only (4.42) questions compared to verbal-only (4.76) and combined-information (4.88) questions. See the General Discussion for further explanation of these results.

In order to test for incidental foreign language acquisition from watching movies, the second experiment involved the introduction of two French vocabulary tests. Based on the comparison of overall performance on the vocabulary tests (see Table 5), no significant

differences were found between conditions. The uniformly low scores on the French vocabulary tests were likely due to the difficulty of the tasks themselves. Participants were presented with 30 content words from each movie clip and asked to match the French words with the appropriate English translation from the word bank. The word banks consisted of 40 English words from each scene, so 10 English words from each set were used as distractors. Overall, the poor scores suggest the tasks were too difficult for the participants. In order to make the tests easier for participants, the total number of words could be reduced, so that participants would no longer be overwhelmed by the length of the test.

Another likely explanation for the low scores on the French vocabulary tests is that the 10-minute movie clips did not provide participants with enough exposure to the French language to lead to measurable acquisition of vocabulary; however, the study by D'Ydewalle & Van de Poel (1999) found foreign language acquisition when their stimuli were presented for 10-minutes. One potential explanation for the difference in findings between the current study and D'Ydewalle & Van de Poel's study is that the stimuli presented differed drastically. Specifically, the stimuli used by D'Ydewalle & Van de Poel (1999) were successive still frames of a video which contained both the pictorial and verbal information; whereas, the current study used dynamic movies presented in real time. The increased complexity associated with a dynamic video as opposed to still frames of a video might have resulted in a reduction in attention to the foreign language words. Another explanation could be that the students used in the study by D'Ydewalle and Van de Poel (1999) were native to Belgium, and the Dutch is more closely related to Danish than English is to French. The greater commonality between Dutch and Danish might explain the difference in foreign language acquisition between D'Ydewalle and Van de Poel (1999) and the current study (Experiment 2).

To further understand the main effects and interactions between variables, simple effects tests were conducted. Previous research by D'Ydewalle et al. (1991) revealed that television programs presented in a standard subtitling format yields better performance on verbal recognition tasks than television programs presented in a reverse subtitling format. Participants in the current study performed better on verbal-only and combined-information tasks when verbal information was presented in the subtitles than when verbal information was in the soundtrack, consistent with D'Ydewalle et al (1991) and the principle of encoding specificity (Tulving & Thomson, 1973). See Table 2 for comparison of overall mean scores on recognition tests by presentation format.

The simple effects tests comparing presentation format, question type and movie produced several results of interest. Consistent with the hypotheses 5a, participants in the FE condition performed significantly better than the EF, FF and NF conditions on verbal-only and combined-information questions, regardless of the movie (see Tables 3 & 4). These results support the previous findings by D'Ydewalle et al (1987; 1991) that reading subtitles is a more efficient way to acquire verbal information than listening to the soundtrack. Additionally, this finding supports the principle of encoding specificity. EF participants also performed better on verbal-only questions than FF and FN participants, which is no surprise, as FF and NF participants were not given any comprehensible verbal information.

Comparison of Experiment 1 and Experiment 2

In order to fully understand the difference in performance between Experiment 1 and Experiment 2, two planned comparisons between experiments were conducted. Two 2x3 mixed factorial MANOVAs were used to compare performance of EN participants to EF participants and to compare performance of NE participants to FE participants on recognition tasks.

Comparison of EN and EF participants revealed EN participants performed significantly better than EF participants on verbal-only questions, $F(1, 49)=57.91$, $p<.001$, partial $\eta^2=.37$; pictorial-only questions, $F(1, 49)=24.20$, $p<.001$, partial $\eta^2=.20$; and combined-information questions, $F(1, 49)=28.75$, $p<.001$, partial $\eta^2=.23$. These finding suggests that the presence of a foreign language subtitles interfered with the participants' abilities to comprehend the relevant verbal information in the soundtrack. One potential explanation for the reduction in performance could be that the presence of the foreign language subtitles triggered an automatic reading response, resulting in the participants' attention being drawn away from the relevant verbal information in the soundtrack. This explanation is consistent with the findings of D'Ydewalle & De Bruycker (2007) and, more generally, the Stroop Effect.

Comparison of NE and FE participants showed that NE participants performed significantly better than FE participants on verbal-only questions, $F(1, 49)=55.97$, $p<.001$, partial $\eta^2=.36$; and combined-information questions, $F(1, 49)=7.53$, $p<.01$, partial $\eta^2=.07$. These findings suggest the presence of a foreign language in the soundtrack interferes with the participants' abilities to comprehend relevant verbal information in the subtitles. One potential explanation for this finding is that attention is captured by irrelevant speech, which then disrupts the comprehension of the written message. This explanation is based on the findings of Martin et al. (1988), where participants performed significantly worse on reading comprehension tests when a foreign language was spoken in the background compared to quiet setting. Overall mean scores across experiments can be seen in Table 6. Based on these comparisons we can conclude that the presentation of an unfamiliar language, either in the form of subtitles or soundtrack, can distract viewers from completely encoding information from the movie scenes, although they are still able to extract some information from the familiar modality. The lack of encoding is likely

the result of the participants' attentional resources being distracted by the presence of the foreign language.

CHAPTER 4 - Chapter 4: General Discussion

Analyses revealed a significant main effect of subtitle/soundtrack presentation format in both experiments. Consistent across the two experiments was the finding that participants presented with verbal information in a familiar language in the subtitles performed significantly better on verbal-only and combined-information questions than participants presented with familiar verbal information only in the soundtrack or not at all. These results are consistent with the findings of D'Ydewalle et al. (1987, 1991), where participants performed better on verbal recognition tests when presented with verbal information in subtitles as opposed to in the soundtrack. There is also consistency between the current results and the principle of encoding specificity, where encoding of verbal information from the subtitles (written) yields the best performance on the written recognition tests requiring verbal information. On the other hand, these results differ from the findings of Mayer and Moreno (1998), who found better retention when verbal and pictorial information were redundantly presented in multiple modalities. A potential reason for the discrepancy between the current results and those of Mayer & Moreno (1998) could be that the tasks used to test retention differed between the studies. Mayer & Moreno (1998) were more interested in determining how students could recall the multimedia message presented, whereas, the current studies focus uses recognition tasks to study retention. Another potential explanation could be that the methods of multimedia presentation used in the current study drastically differed from those of Mayer and Moreno. The current studies used

movie clips which present highly dynamic scenes, whereas the bicycle pump scenes presented by Mayer and Moreno contained less action.

Also consistent across both experiments was a significant main effect of question type. These main effects were primarily due to the uniformly very poor performance on the pictorial-only questions. Refer to Table 1 for overall means of Experiment 1 and refer to Table 2 for overall means for Experiment 2. These findings were inconsistent with previous findings reported in Lang (1995), indicating that pictorial information was automatically encoded, resulting in high scores (80-90%) on pictorial recognition tests. One potential explanation for the contradictory findings is that the pictorial-only recognition tests in the current study involved written questions about pictorial information. The higher performance on pictorial recognition tasks found by Lang (1995) was obtained from a recognition test of still frames from the movie clips, rather than written questions about pictorial information. The inconsistency between the current results and the results of Lang (1995) could be partially explained by principle of encoding specificity, which would predict reduced performance on modality-specific recognition tests when the to-be-recognized information is tested in a different modality than which it had been encoded (Tulving & Thomson, 1973). A complimentary explanation could be that by requiring the participants to convert pictorial information into written text, the task may have resulted in extraneous overload of working memory. This explanation is based on the second assumption of the dual-process theory, i.e. that working memory is a limited capacity system and can thus encounter cognitive overload (Mayer & Moreno, 1998). According to Sweller (1988), extraneous cognitive overload occurs when working memory capacity is overloaded by external factors associated with the examination of the materials. If the question formats for the pictorial-only questions were more difficult than the verbal-only and combined-information questions,

then participants might have experienced cognitive overload of their working memory. An alternative explanation is that because several pictorial-only questions were not directly tied to the plot of the movies, i.e. background information, the observers could have easily overlooked the pictorial cues. Although all questions were pilot tested to ensure they were of appropriate difficulty, relevant to the specific scenes, and appropriately assigned to one of the three question types, it is still possible that participants just found them more difficult during actual testing.

Although both studies yielded poor performance on pictorial-only questions overall, it is important to note that no significant differences between presentation formats were found in Experiment 2; however, several significant differences were revealed across conditions in Experiment 1. Since EN participants performed significantly better on pictorial-only questions than did any other groups in Experiment 1, it was suggested that the reduced visual content (i.e. no subtitles) could have resulted in more attention to the pictorial cues (refer to Experiment 1 discussion for further explanation of pictorial-only questions).

Examination of the French vocabulary tests in the second experiment suggested that either the test was too difficult or the movie clips were not sufficient input for foreign language acquisition or both. The use of matching questionnaires for French vocabulary tests might have encouraged the participants to guess rather than considering each French word individually. To ensure that participants are considering each French vocabulary word independently, future studies could use multiple choice questions as opposed to the matching question format in the current study. Another issue related to the French vocabulary tests was the fact that only 10-minute clips were presented from each film. The very minimal exposure to the French language in the movie clips may have limited the participants' chances to acquire the foreign language words. Perhaps the increased exposure to the French language by presenting the movies in their

entirety would provide participants with a greater opportunity to acquire relevant French vocabulary words. By increasing the exposure through longer movie presentations, the French vocabulary tests might be a better test of foreign language acquisition. Although increased exposure to the foreign language could yield better foreign language acquisition, former studies have shown significant foreign language acquisition with 10-15 minute presentations (D'Ydewalle & Van de Poel, 1999; Koolstra & Beentjes, 1999). Refer to Experiment 2 discussion for specific differences between the current stimuli and the stimuli used in former studies investigating foreign language acquisition.

The results from the current studies suggest that viewing a movie with closed-captions (e.g. EE) or native language standard subtitles (e.g. FE) provides a greater understanding of the movie than viewing a movie in one's native language soundtrack with no subtitles (e.g. EN). Although this may seem contradictory because movies in standard presentation format are more commonly viewed than closed-captioned or subtitled movies, there are reasonable explanations for the findings. As noted throughout the discussions of each study, the principle of encoding specificity clearly explains the higher scores on verbal-only and combined-information questions when the relevant verbal information was presented in the subtitles. Another explanation could be that people viewing a movie with closed-captions or subtitles are required to be more attentive to the movie overall than people viewing movies in standard presentation formats. For instance, a person viewing a movie in standard format may split their attention between the movie and another task (i.e. completing math homework) because they can obtain the gist of the movie by simply hearing the spoken information in the soundtrack. When a person is required to acquire the verbal information visually, as in the deaf reading closed-captions or Americans watching foreign movies subtitled in English, visual attention must remain continually focused on the

movie in order to obtain the relevant verbal cues. Additionally, as previously mentioned, the presence of a foreign language in the soundtrack or subtitles may distract from complete comprehension. Since closed-captions and subtitles were shown to provide a better transmission of verbal content than soundtracks alone, movie producers might want to take a closer look at the information they are omitting when creating condensed subtitles.

Despite the fact that the current experiments suggest viewing a movie with native language subtitles yields better comprehension than viewing a movie with only a native language soundtrack, many people, especially in the United States, are still reluctant to view subtitled films. One potential explanation is that watching movies is used as a leisure activity, so people do not desire to use high levels of cognitive processing. Because greater focalization of attention and more mental effort is needed to process verbal information in the subtitles (i.e. reading) as opposed to in the soundtrack, people viewing movies purely for entertainment may be less inclined to watch subtitled movies.

Based on the comparison of the current results to previous findings, there are three potential limitations to the study. First, the current studies do not include a single-channel presentation containing only verbal information. In order to strengthen the claim that multiple-channel messages yield better comprehension future studies might include a verbal-only condition where participants are presented with subtitles or soundtrack in the absence of pictorial information. The second limitation of the current studies is that written questions were used to test recognition of pictorial information. Based on the principle of encoding specificity, the use of still frames from the movie clips for the pictorial recognition tests might provide a better test of pictorial recognition abilities. A third limitation of the current studies is that only recognition measures were used, so limited conclusions could be drawn about working memory and dual-

process theories. In future studies the comprehension tests might also incorporate free-recall measures, to allow for comparisons between recognition and recall of movie content. These new comparisons might provide further information for predictions about working memory and dual-processing.

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Appendix A - Table of Results

Table A.1: Experiment 1: Overall Mean Scores for Recognition Tests

Mean Scores for Recognition Tests				
	Pictorial-only	*Verbal-only*	*Combined*	**MM**
Eng-Eng (EE)	4.62	8.12	7.38	6.71
Eng-No (EN)	5.09	7.43	6.82	6.45
No-Eng (NE)	4.60	8.34	7.33	6.76
No-No (NN)	4.46	3.30	3.75	3.84
MM	4.69	6.80	6.32	5.94

Table A.2: Experiment 2: Overall Mean Scores for Recognition Tests

Mean Scores on Recognition Tests				
	Pictorial-only	*Verbal-only*	*Combined*	**MM**
Eng-Fr (EF)	4.15	5.05	5.32	4.84
Fr-Eng (FE)	4.55	6.69	6.69	5.98
Fr-Fr (FF)	4.54	3.60	3.92	4.02
No-Fr (NF)	4.44	3.69	3.59	3.91
MM	4.42	4.76	4.88	4.69

Table A.3: Experiment 2: Mean Scores for A Few Good Men Recognition Tests

Mean Scores on A Few Good Men Recognition Tests				
	Pictorial-only	*Verbal-only*	*Combined*	**MM**
Eng-Fr (EF)	4.50	5.84	5.08	5.14
Fr-Eng (FE)	5.04	7.22	6.14	6.13
Fr-Fr (FF)	5.10	4.26	3.88	4.41
No-Fr (NF)	4.54	4.34	3.56	4.15
MM	4.80	5.42	4.67	4.96

Table A.4: Experiment 2: Mean Scores for See No Evil, Hear No Evil Recognition Tests

Mean Scores on See No Evil, Hear No Evil Recognition Tests				
	Pictorial-only	*Verbal-only*	*Combined*	**MM**
Eng-Fr (EF)	3.80	4.26	5.56	4.54
Fr-Eng (FE)	4.06	6.16	7.24	5.82
Fr-Fr (FF)	3.98	2.94	3.96	3.63
No-Fr (NF)	4.34	3.04	3.62	3.67
MM	4.05	4.10	5.10	4.42

Table A.5: Experiment 2: Mean Scores on French Vocabulary Tests

Mean Scores on French Vocabulary Tests (out of 30)			
	A Few Good Men	See No Evil, Hear No Evil	MM
Eng-Fr (EF)	3.04	3.18	3.11
Fr-Eng (FE)	2.92	2.7	2.81
Fr-Fr (FF)	3.28	2.94	3.11
No-Fr (NF)	3.14	3.22	3.18
MM	3.095	3.01	3.05

Table A.6: Experiments 1 & 2: Overall Mean Scores for Recognition Tests

Mean Scores on Recognition Tests				
	Pictorial-only	*Verbal-only*	*Combined*	**MM**
Eng-Eng (EE)	4.62	8.12	7.38	6.71
Eng-No (EN)	5.09	7.43	6.82	6.45
No-Eng (NE)	4.60	8.34	7.33	6.76
No-No (NN)	4.46	3.30	3.75	3.84
Eng-Fr (EF)	4.15	5.05	5.32	4.84
Fr-Eng (FE)	4.55	6.69	6.69	5.98
Fr-Fr (FF)	4.54	3.60	3.92	4.02
No-Fr (NF)	4.44	3.69	3.59	3.91
MM	4.56	5.78	5.60	5.31

Appendix B - Comprehension Tests

B.1: A Few Good Men Comprehension Test

A Few Good Men Questions

Please circle the answer which corresponds to the previously viewed scene. If you do not know the answer please make an educated guess.

1. All of the members on the jury wearing?
    a. Navy Uniforms
    b. Army Uniforms
    c. The same uniform
    d. Different Uniforms
2. What color was the judges uniform?
    a. Navy Blue
    b. White
    c. Army Green
    d. Brown
3. What was the order Lieutenant Kendrick gave concerning the victim?
    a. He was to be transferred
    b. He was to be punished for his actions
    c. He was not to be touched
    d. He was not to be transferred
4. What was used to bind the victim's arms and legs?
    a. Rope
    b. Wire
    c. Tape
    d. Chains
5. What color were the patches on Daniel Kaffee's shoulders?
    a. Red
    b. White
    c. Yellow
    d. No patches were present
6. Where did the alleged crime take place?
    a. Washington DC
    b. Florida
    c. Mexico
    d. Cuba
7. The prosecution had _____ representing lawyers.
    a. 1
    b. 2

c. 3
d. 4

8. What are the names of the defendants?
    a. Lance Corporal Dawkins and Private Downey
    b. Lance Colonel Dawson and Private Downey
    c. Lance Corporal Dawson and Private Downey
    d. Lance Colonel Dawkins and Private Downey

9. When facing the bench (where the judge sits) what side is the American flag on?
    a. Left
    b. Right
    c. Both
    d. Neither
10. When Daniel Kaffee objected during the scene, what was the objection for?
    a. Hear Say
    b. Speculation
    c. Badgering
    d. Leading
11. What was the name of the victim?
    a. PFC William Santana
    b. PFC William Starling
    c. PFC William Sampson
    d. PFC William Santiago
12. The water pitchers on all of the tables were what color?
    a. Silver
    b. Clear
    c. Black
    d. Gold
13. What rank is Daniel Kaffee?
    a. Colonel
    b. Major
    c. Lieutenant
    d. Sergeant
14. The defendants were accused, specifically, of doing what to the victim?
    a. Binding the victim and beating him
    b. Binding the victim and shoving a rag down his throat
    c. Binding the victim and assaulting him
    d. Binding the victim and choking him
15. What was the name of the second witness?
    a. Corporal Carl Edward Haymaker
    b. Colonel Carl Edward Hammaker
    c. Corporal Carl Edward Hammaker
    d. Colonel Carl Edward Haymaker
16. The judge presiding over the case was _____.
    a. A white woman
    b. A white man

c. A black man
d. A black woman

17. What was the name of the illness, developed by the victim, which led to his death?
    a. Lactic Myosis
    b. Lactic Acidosis
    c. Lactic Arterosis
    d. Lactic Diagnosis

18. The defense had _____ representing lawyers.
    a. 1
    b. 2
    c. 3
    d. 4
19. What color were the patches on the second witness's shoulders?
    a. White
    b. Red
    c. Yellow
    d. No patches were present
20. The first witness testified that he investigated what in relation to the trial?
    a. The illegal rifle shooting
    b. The death of a marine
    c. A platoon disobeying direct orders
    d. Complaints of a marine concerning his unit
21. The defense's main argument is that the two accused _____.
    a. Were provoked by the victim
    b. Did not violate any military laws
    c. Did not know otherwise
    d. Did what they were told to do
22. How many microphones are located on the plaintiff's table?
    a. 1
    b. 2
    c. 3
    d. None
23. All of the spectators in the audience were wearing?
    a. Military Uniforms
    b. Civilian Clothing
    c. Different Clothes
    d. No spectators were present
24. At what time was the victim declared dead?
    a. 17 minutes after midnight
    b. 27 minutes after midnight
    c. 37 minutes after midnight
    d. 47 minutes after midnight
25. How many jurors were present at the trial?
    a. 12
    b. 8

c. 9
d. 10

26. The defendants are _____.
    a. Both white males
    b. Both black males
    c. One black male and one white male
    d. They never showed the defendants

27. On what day did the alleged crime take place?
    a. September 6th
    b. November 6th
    c. October 6th
    d. December 6th
28. What are the two defendants on trial for?
    a. Illegal fence-line shooting
    b. Bribery
    c. Murder
    d. Assault
29. What color was the code that the prosecution referred to?
    a. Orange
    b. Red
    c. Blue
    d. Yellow
30. How many guards are stationed at the back of the courtroom?
    a. 1
    b. 2
    c. 3
    d. None
31. The first witness worked for which department?
    a. Department of defense
    b. Naval Investigative Services
    c. Judge Advocate General Core (aka JAG Core)
    d. Marine Special Investigation Unit
32. How many microphones were present on the defendant's table?
    a. 1
    b. 2
    c. 3
    d. None
33. What was the only question Daniel Kaffee asked the second witness?
    a. If he was present at the meeting with Lieutenant Kendrick
    b. If he was a member of the second platoon stationed at Guantanamo Bay
    c. If he was present in the room with victim 5 minutes after the platoon meeting
    d. If he was a marine under the supervision of Lieutenant Kendrick

Question Breakdown

Pictorial-only: 1, 2, 7, 9, 16, 18, 22, 23, 25, 32

Verbal-only: 3, 4, 6, 8, 11, 14, 17, 24, 27, 29

Redundant Information: 5, 10, 13, 15, 19, 20, 21, 26, 31, 33

Extra Questions: 12, 28, 30

B.2: See No Evil, Hear No Evil Comprehension Test

See No Evil Hear No Evil Questions

Please circle the answer which corresponds to the previously viewed scene. If you do not know the answer please make an educated guess.

1) What was the saying on the black t-shirt at the start of the first scene?
    a. No Fear
    b. I love New York
    c. No Pain No Gain
    d. USA
2) Which branch of the military was the bully formerly a member?
    a. Army
    b. Navy
    c. Air Force
    d. Marine Corp
3) How much money did Wally spend on alcohol after he found out he was blind?
    a. $25
    b. $35
    c. $45
    d. $55
4) All of the following qualifications were in the ad in the paper EXCEPT?
    a. Ivy League Type
    b. Sales Experience
    c. Tall, Dark and Handsome
    d. Sense of Humor
5) Who does Wally ask David if he likes?
    a. Harry Waldorf
    b. Harvey Waldorf
    c. Harry Wallbanger
    d. Harvey Wallbanger
6) Wally is:
    a. Deaf
    b. Blind
    c. Mute
    d. Deaf and Blind
7) David Lyons is:
    a. Deaf
    b. Blind
    c. Mute
    d. Deaf and blind
8) What are the names of Wally's friends at the bar?
    a. Lisa and Sally
    b. Leslie and Stella
    c. Lisa and Stella

d. Leslie and Sally

9) What color are the aprons worn by the waitresses in the bar?
   a. Blue
   b. Red
   c. Green
   d. White

10) What brand of beer is promoted by the neon light behind the bar?
   a. Coors
   b. Miller
   c. Budweiser
   d. Michelob

11) Which nostril did David have blood coming from after the fight?
   a. Right
   b. Left
   c. Neither
   d. Both

12) What color are David Lyons' suspenders?
   a. Black
   b. Tan
   c. Grey
   d. Blue

13) What are the first items that Wally knocks off the counter?
   a. Tic Tacs
   b. Film Canisters
   c. Watches
   d. Batteries

14) What did Wally say he heard when addressed by the bully in the bar?
   a. War Call
   b. Fighting Call
c. Mating Call
   d. Order Call

15) What article of clothing was David Lyons standing on when the bully confronted him in the bar?
   a. Shoe
   b. Pants
   c. Jacket
   d. Hat

16) Which one of the following was not a wage offer made by Wally?
   a. $350
   b. $300
   c. $325
   d. $225

17) What was the first time said by David that ended in a landed punch by Wally?
a. 12 O'clock
b. 11 O'clock
c. 1 O'clock

d. 3 O'clock

18) What did David tell Wally his job depended on?

a. Review of his resume
b. Outcome of the bar fight
c. Comparison with other applicants
d. Getting him a date

19) What type of alcoholic beverage did Wally purchase and drink when he found out he was blind?

a. Chambord
b. Champagne
c. Captain
d. Cognac

20) Where did Wally ask his sister to drop him off at?

a. Jones Beach
b. Jersey Beach
c. Brighton Beach
d. Long Beach

21) Which cheek did Wally get a bruise on from the fight?

a. Right
b. Left
c. Neither
b. Both

22) Which direction did Wally and David circle second in the fight?

a. Right
b. Left
c. Back
d. Forward

23) What type of shirt was the bully in the bar wearing?

a. Flannel
b. Vertical Stripes
c. Horizontal Stripes
d. Solid Color

24) What caused David's deficit?

a. Ear Infection
b. Eye Infection
c. Scarlett Fever
d. Syphilis

25) What does David say he wants out of life when asked by Wally?

a. To overcome his fears
b. To travel the world
c. Not to have his deficit
d. Not to make a fool out of himself

26) What color was Wally's sweater?

a. Blue
b. Black
c. Green

d. White

27) Where did Wally's first dart hit in relation to the dart board?
    a. Above and Right
    b. Above and Left
    c. Below and Right
    d. Below and Left
28) What shape was the clock located in the bar?
    a. Circle
    b. Square
    c. Rectangle
    d. Hexagon
29) What type of shirt was David wearing?
    a. Flannel
    b. Vertical Stripes
    c. Horizontal Stripes
    d. Solid Color
30) What did Wally tell his friends about his and David's relationship?
    a. Old friends
    b. Forming a business venture
    c. Newly acquainted friends
    d. Sold their business
31) Which of the bully's family members did Wally say he was with "last night"?
    a. Wife
    b. Mother
    c. Sister
    d. Cousin
32) What did Wally call the bully in the bar?
    a. Custodian
    b. Coward
    c. Cousin
    d. Constable
33) What does Wally claim was the final agreement for his weekly wage?
    a. $350
    b. $300
    c. $325
    d. $225
34) Who bought the first round of drinks in the bar?
    a. Sally
    b. Stella
    c. Lisa
    d. Leslie
35) What form of soldier does the bully assume Wally was?
    a. Navy Seal
    b. Green Beret
    c. Marine Scout
    d. Army Ranger

Question Breakdown

Pictorial-only: 10, 11, 12, 13, 21, 23, 26, 27, 28, 29

Verbal-only: 4, 16, 18, 19, 20, 24, 25, 30, 33, 35

Redundant Information: 2, 5, 8, 14, 15, 17, 22, 31, 32, 34

Extra Questions: 1, 3, 6, 7, 9

Appendix C - French Vocabulary Tests

C.1: French Vocabulary Test for A Few Good Men

French Vocabulary Test

Instructions: Use the word bank to determine the definition of each French Term. Fill-in the blank next to the French term with the number which corresponds to the English translation.

Word Bank

1. adhesive	9. facts	17. lungs	25. regulation	33. to divert
2. betrayed	10. first	18. mean	26. room	34. to inquire
3. barracks	11. gorges	19. member	27. second	35. to sit
4. chains	12. government	20. mislead	28. soak	36. to succeed
5. choke	13. harness	21. missing	29. solemnly	37. to try
6. convert	14. informer	22. numerous	30. swear	38. watch
7. crimes	15. kidneys	23. obey	31. tape	39. will show
8. discovered	16. legs	24. question	32. to dazzle	40. witness

adhésif		Étouffé		obéissez	
asseoir		Faits		poumons	
chambrée		Gorge		réussir	
découvert		Inculpations		signifie	
délateur		Interrogé		solennellement	
démontrera		Jambes		témoin	
détourner		Jurez		tenter	
deuxième		Manquante		trahi	
éblouir		Membre		trempé	
enquêter		Nombreuses		trompez	

C.2: French Vocabulary Test for See No Evil, Hear No Evil

French Vocabulary Test (S)

Instructions: Use the word bank to determine the definition of each French Term. Fill-in the blank next to the French term with the number which corresponds to the English translation.

Word Bank

1. black hole	9. eleven	17. magazine	25. right	33. twelve
2. born	10. eyes	18. man	26. sand	34. understood
3. bottle	11. friend	19. nervous	27. sister	35. upholster
4. bought	12. glasses	20. party	28. salesman	36. vest
5. coat	13. hear	21. police	29. speak	37. wife
6. contact lenses	14. introduce	22. policy	30.store	38. witch
7. cry	15. irritate	23. rent	31. surrounded	39. years
8. deaf	16. left	24. return	32. thirteen	40. yesterday

acheté		gauche		présente	
ami		hier		rentre	
ans		homme		sable	
bouteille		lentilles		soeur	
compris		magasin		sorcière	
droite		né		sourd	
entends		onze		trou noir	
entouré		parlez		vendeur	
femme		pleurer		veste	
fête		policier		yeux	

Appendix D - Demographic Questionnaires

D.1: Demographic Questionnaire Experiment 1

Demographic Questionnaire

Age_____

Gender (circle one): Male Female

Year in School: FR SO JR SR

Movie Related Question

1. Had you ever seen <u>See No Evil, Hear No Evil</u> prior to this experiment?
    a. Yes
    b. No
    c. Not sure
2. Had you ever seen <u>A few Good Men</u> prior to this experiment?
    a. Yes
    b. No
    c. Not sure
3. How much would you like to watch <u>See No Evil, Hear No Evil</u> in its entirety after viewing this clip?
    a. Very Likely
    b. Likely
    c. Undecided
    d. Not Likely
    e. Very Unlikely
4. How much would you like to watch <u>A Few Good Men</u> in its entirety after viewing this clip?
    a. Very Likely
    b. Likely
    c. Undecided
    d. Not Likely
    e. Very Unlikely

D.2: Demographic Questionnaire Experiment 2

Demographic Questionnaire

Age_____

Gender (circle one): Male Female

Year in School: FR SO JR SR

Familiarity with French Language

1. How familiar are you with the French Language?
    a. Very Familiar
    b. Slightly Familiar
    c. Undecided
    d. Very little familiarity
    e. Not at all familiar
2. Have you taken any classes involving learning French as a second language?
    a. Yes
    b. No
3. If yes, how many semesters did you take French as a second language?
    a. High School _____
    b. College _____
4. Have you ever spent time in a French-speaking country?
    a. Yes
    b. No
5. If yes, how long did you spend in the French-speaking country?
    a. _____

6. Rate you ability to understand Spoken French

No Understanding 1 2 3 4 5 6 7 Full Understanding

7. Rate your ability to understand Written French

No Understanding 1 2 3 4 5 6 7 Full Understanding

Movie Related Question

1. Had you ever seen <u>See No Evil, Hear No Evil</u> prior to this experiment?
    a. Yes
    b. No
    c. Not sure
2. Had you ever seen <u>A few Good Men</u> prior to this experiment?
    a. Yes
    b. No
    c. Not sure
3. How much would you like to watch <u>See No Evil, Hear No Evil</u> in its entirety after viewing this clip?
    a. Very Likely
    b. Likely
    c. Undecided
    d. Not Likely
    e. Very Unlikely
4. How much would you like to watch <u>A Few Good Men</u> in its entirety after viewing this clip?
    a. Very Likely
    b. Likely
    c. Undecided
    d. Not Likely
    e. Very Unlikely