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Abstract

People enjoy the affective response engendered by filmmakers through narrative. In two experiments, we tested the role of film audio and working memory on a predictive inference important for narrative suspense. Participants watched three minutes of *Touch of Evil*. We manipulated knowledge of a time-bomb when the scene starts. Audio increased the likelihood of generating a bomb related inference (Experiment 1). Participants higher in working memory were more likely to generate bomb inferences (Experiment 2).

Keywords: film narrative comprehension, mental model construction, predictive inferences

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> *We are now having a very innocent little chat. Let's suppose that there is a bomb underneath this table between us. Nothing happens, and then all of a sudden, "Boom!" There is an explosion. The public is surprised, but prior to this surprise, it has seen an absolutely ordinary scene, of no special consequence. Now, let us take a suspense situation. The bomb is underneath the table and the public knows it, probably because they have seen the anarchist place it there. The public is aware the bomb is going to explode at one o'clock and there is a clock in the decor. The public can see that it is a quarter to one. In these conditions, the same innocuous conversation becomes fascinating because the public is participating in the scene. The audience is longing to warn the characters on the screen: "You shouldn't be talking about such trivial matters. There is a bomb beneath you and it is about to explode!"* (Truffaut, Hitchcock, & Scott, 1984, p. 73)

People around the world watch film, but what makes it such a ubiquitous medium? One potential reason is that film narrative engenders affective responses that are considered pleasurable (Smith, 1995). Hitchcock's famous quote provides a window into the art of storytelling that reflects this idea. The opening scene of Orson Welles' Touch of Evil (Welles & Zugsmith, 1958) (details of clip below) famously illustrates Hitchock's point. It depicts a couple walking through busy streets. Prior to introducing the couple, a time bomb is placed in a car, which is in close proximity to the couple (Figure 1). The soundtrack makes it clear that the car is

in close proximity. Viewers likely predict that the bomb will explode during the scene, which is a source of suspense.

This scene illustrates a phenomenon that happens in narrative film (and narratives in general). A story element is introduced and the viewer must maintain the activation of a token to represent that information in working memory over time. Filmmakers can use things like the soundtrack to help the viewer keep this information in mind. Walter Murch (Tully, 1999) explicitly acknowledged that his sound mix was created to keep the bomb in the minds of the viewers in order to engender suspense. From a cognitive perspective, Murch was reducing working memory burdens on the viewer by providing retrieval cues that support resonance processes that keep prior story constituents available in working memory (Myers & O'Brien, 1998).

The goal of this study is to better understand if this scene works as predicted by the filmmakers. While the study is specific to this film, we believe it sheds insights to how cinematic devices, such as the soundtrack, can be used to support inference processes (Magliano, Dijkstra, & Zwaan, 1996).

Figure 1. Frames illustrating important shots in the 3 minute 12 second clip from the film Touch of Evil (Welles & Zugsmith, 1958).

Experiment 1

Experiment 1 tested if the presence of the soundtrack affected the likelihood of generating a prediction about the bomb. College students (N = 94) watch the scene and at the end of the scene were asked to write an answer to the question, what happens next? The answers were coded for whether or not the participants predicted that the bomb would explode. The experiment employed a 2 (Soundtrack: present, absent) X 2 (Bomb contexts: present absent) design. In the bomb present condition, participants saw the segment of the clip showing a person putting the bomb in the car, and in the absent condition they started after the bomb was placed. A chi-square analysis of predictions at the end of the clip showed that participants in the bomb

present condition were more likely to make a predictive inference about the bomb (X^2 (1, N = 94) = 28.517, p < .001; *Eta* = .551; Figure 2), which importantly showed participants in the bomb present condition did maintain activation of the bomb in working memory. Further, in the bomb present condition, participants who had the audio were about twice as likely to make a bomb inference (76%) than when there was no audio (41%; X^2 (1, N = 50) = 5.99, p = .014; Eta = .346).

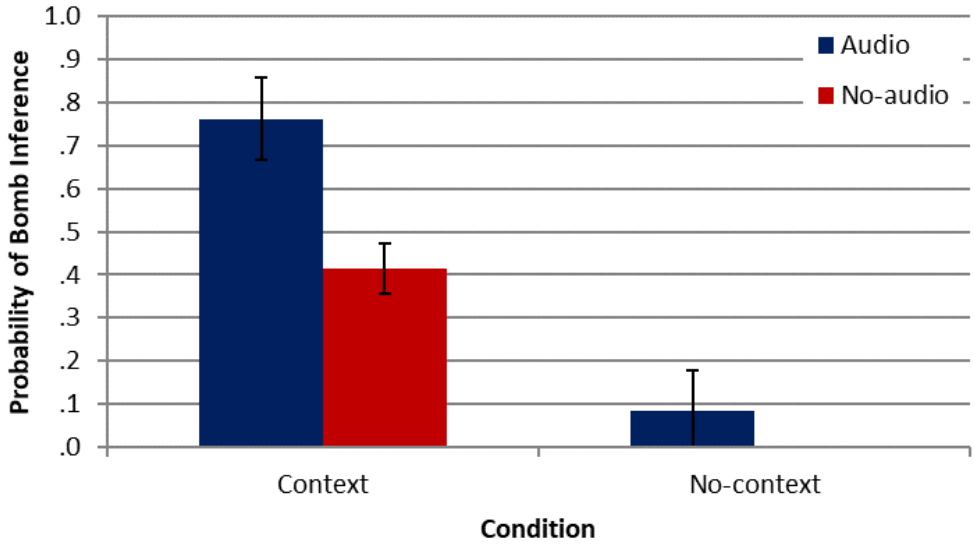

Figure 2. Probability of making an inference about the bomb. Context condition is on the left, and No-context is on the right. Audio condition is in Blue, and No-audio is in Red.

Experiment 2

Surprisingly, only about 40% of the participants bomb present, no-audio condition made a bomb inference. We hypothesized that this happened because without the soundtrack there is a heavy burden placed on working memory. Experiment 2 tested this hypothesis. College students (N = 82) watched the film and answered the "What happens next?" question. Presence

of the bomb was manipulated, but the soundtrack was not presented to anyone. Working memory was assessed with a composite of the OSPAN (Turner & Engle, 1989), RSPAN (Daneman & Carpenter, 1980), and CSPAN (Case, Kurland, & Goldberg, 1982). Again, approximately 40% of participants in the bomb present condition made a predictive inference about the bomb. As predicted, a *t*-test showed that in the bomb present condition, participants who made the predictive inference did have higher working memory span (t (29) = 2.310, p = .028, d = .918).

Conclusion

One potential reason film is so popular around the world is that narrative engenders affective responses that are considered pleasurable (Smith, 1995). This study illustrates that in this scene, the filmmakers used sound editing to create a common experience, and specifically a prediction that the bomb will explode. Welles and Hitchcock understood that prediction can influence viewer responses, such as suspense, that make narratives pleasurable (Brewer & Lichtenstein, 1982). The results of experiment 2 suggest that these techniques can serve as a compensatory mechanism to ameliorate the impact of individual difference factors that are known to affect inference processing, such as working memory (Whitney, Richie, & Clark, 1991).

We characterized this study as an experimental case study. Like all case studies, there are limitations to the generalizability of our interpretations. Nonetheless, filmmakers rely on a common set of practices to create a narrative experience for viewers (Bordwell, 1985). While we have primarily learned how this scene works, the use of camera and soundtrack editing to influence inference generation, and more specifically prediction is not unique to this film

(Magliano et al., 1996). Nonetheless, developing studies using multiple scenes from commercially produced films is warranted.

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