

## The Effect of Labeling Video Clips as Real People or Actors on Physiological Responses

### Abstract

Media can present content that seems and is more or less real. News shows pictures of actual events, feature films show pictures that are contrived, and all media offer content that can be taken as reality or fantasy depending on the beliefs viewers bring to the experience. Regardless of why content is perceived as fantasy or reality, sometimes signaled in the content and sometimes determined by pre-existing beliefs, it is presumed that the summary perception of fantasy versus reality matters. Two experiments were conducted to test physiological responses to video clips labeled as Real People or Actors. In Study 1, labels of Real People increased skin conductance levels, indicating increased preparation for action, for content with survival implications (e.g., segments with sexual or threatening themes). Study 2 replicated this effect independent of content. Heart rate variability analyses did not support the hypothesis that emotion regulation occurs while processing fantasy content, rather they suggest individuals are actively engaged when processing reality content.

“Although the experience of entering a fictional world is merely psychological, the experience is cognitively similar to physically experiencing a real situation, rendering the distinction between real and unreal meaningless” (Worth, 2004).

## Introduction

Media arouse emotional responses because they excite the same neural mechanisms in the brain that evolved in the real world. The International Affective Picture System (Lang, 1998) demonstrates that pictures of "primary reinforcers" such as threatening or erotic stimuli elicit higher levels of sympathetic arousal, which prepares individuals to act on perceived threats and opportunities. Although pictures do not present the same consequences or opportunities as their referents, pictures activate defensive and appetitive motivational states based on their association with "primary reinforcers" essential to survival in the real world (Bradley, 2001).

Numerous studies have been conducted to explain how individuals form perceptions of media as more or less real. As outlined in Table 1, a complex interaction of factors can influence media realism perceptions, including structural and content features of the message, and viewer's expectations, motivations and information processing abilities. Regardless of how the perception of realism is formed, the assumption is that the perception matters. The present study aims to manipulate perceptions of media realism to test its effect on emotional responses to media.

Emotional experience has been described as a fundamental component in the psychological state of “presence” in which people respond to media as though it represented real life. The concept of presence describes the ability of virtual environments to “induce a mental state in their users making them feel, act and react as they would in a corresponding real world setting” (Whitton, 2003), and is defined as “A psychological state in which virtual objects are experienced as actual objects in either sensory or non-sensory ways,” (Lee, 2004). Similarly, transportation theory describes a psychological state in which the transported reader “loses access to some real world facts in favor of accepting the narrative world ... [and] may experience

strong emotions and motivations, even when they know the events in the story are not real,” (Green & Brock, 2000). Involvement, a dimension of presence (Klimmt & Vorderer, 2003; Witmer & Singer, 1998; Biocca, Burgoon, Harms, & Stoner, 2001), has been described as a fascinated, emotionally and cognitively engaged way of enjoying a mediated presentation in which people do not take notice of the mediated quality of the experience. Low involvement is a distant, analytical state in which people are conscious of the mediated nature of the experience, (Vorderer, 1992). Focus groups report that they consider emotionally engaging television programs to be more realistic (Hall, 2003). Transportation, or audience engagement and involvement with a narrative, has been shown to correlate positively with perceived realism, particularly when audiences suspend a critical mindset, (Busselle et al., 2004; Green, 2004; Wilson & Busselle, 2004).

To measure perceptions of presence, researchers typically assess the extent to which participants’ self-reported emotional responses match those expected in a corresponding real world situation, and the extent to which participants self-report that the virtual environment seems real. Similarly, the transportation scale developed by Green and Brock (2000) assesses narrative engagement through emotional involvement, cognitive attention, feelings of suspense, lack of awareness of immediate surroundings and mental imagery. Researchers have suggested the need for a standardized measure of the perception of Presence, (e.g. Lee, 2004; Whitton, 2003), and physiological responses proposed as a candidate, (Ravaja, 2004). In studies comparing stressful and non-stressful virtual environments, heart rate and skin conductance responses indicated appropriate stress and relaxation responses, (Meehan, Insko, Whitton, and Brooks, 2002; Meehan, Razzaque, Insko, Whitton, Brooks, 2005); however, the subjective sense of presence was not manipulated and its effect on physiological responses was not shown. The

effect of realism on emotional responses to media has been demonstrated in two studies in which a violent film clip shown to college age men increased skin conductance responses when labeled as a documentary versus Hollywood production, (Geen, 1973; Geen & Rakosky, 1975).

However, these studies compared mean levels of skin conductance in response to a single, highly arousing, negative video clip, and it is unclear whether today's media users would show the same response. The present study employs a large set of video clips showing arousing and neutral emotional content to test the effect of media realism on the intensity and valence of emotional responses using self report, and online skin conductance and heart rate measures. The present study also examines the duration of the effect over the course of a 22 minute and 47 minute presentation.

Emotional intensity is conceptualized as the extent to which appetitive or defensive motivational systems (Lang, 1997) are activated. As emotional intensity increases, physiological responses correspond to a transition from attention to action, (Bradley, Codispoti, Cuthbert & Lang 2001). Whereas skin conductance (sympathetic arousal) increases linearly, the cardiac response initially decelerates, indicating heightened orienting and attention, and then shifts to acceleration indicating preparation for action at higher levels of motivation activation.. Lang and colleagues (1997) suggested that picture viewing is analogous to the "post-encounter stage" of the Defense Cascade Model, or the period building up to actual mobilization. Preparation for action in response to a symbolic representation indicates a psychological state in which viewers are anticipating consequences equivalent to a real life referent. Within this model of physiological indices of the transition from attention to action, we hypothesize video clips believed to show fiction will correspond to the attention phase, while clips perceived as reality will correspond more closely to preparation for action. Specifically, physiological responses

while processing media perceived as real should produce increased skin conductance and accelerated heart rate, depending on the extent to which participants anticipate a threat or opportunity that warrants mobilization. Physiological responses during processing fictional media should involve passive, perceptual intake of cues and orienting, characterized by decelerated heart rate and moderate skin conductance responses. Thus, in line with a motivational theory of emotion (Bradley, Codispoti, Cuthbert & Lang 2001), we hypothesize:

H1: Highly emotional video clips (versus neutral) will elicit increased motivation activation and preparation for action, indexed by increased skin conductance and heart rate acceleration.

H2: Video clips labeled as real people (versus actors) will elicit increased motivation activation and preparation for action, indexed by increased skin conductance and heart rate acceleration.

One possible explanation for a realism effect on emotional intensity is that viewers may consciously and actively remind themselves that media is “not real” in order to regulate the emotional impact, (e.g. Cantor & Wilson, 1984). *Cognitive reappraisal* is a term applied to instances in which an individual changes the way she thinks about a potentially emotion-eliciting situation in order to modify its emotional impact (Gross, 1998). Heart rate variability measures have been demonstrated as a reliable index of active emotion regulation in emotion-inducing situations, (Butler, Wilhelm & Gross, 2006). The central autonomic network (CAN) assists emotional regulation by adjusting physiological arousal to appropriately match external and internal environments. Heart rate variability measures the moment-to-moment output of the CAN and provides an index of an individual's capacity to generate regulated physiological responses in the context of emotional expression (Thayer & Lane, 2000; Thayer & Siegle, 2002). The present

study will test whether emotion regulation occurs during processing fictional content by examining the effect of perceived realism on heart rate variability:

H3: If viewers are regulating emotions during processing of fictional content, heart rate variability will increase, accompanied by lowered arousal and more positive self-reported valence for fictional content.

## STUDY 1

### Methods

*Stimuli.* Forty six-second video clips that could be convincingly labeled as Real People or Actors were carefully selected from obscure fictional and documentary films. Video clips were carefully selected to exclude formal and content features commonly associated with reality and fantasy genres, identified in Table 2. In order to preserve the ambiguity of the clip so that it could be labeled convincingly as reality or fantasy, we found clips needed to be six seconds. Beyond six seconds, genre cues generally revealed the clip's status from a reality or fantasy source. In addition, previous research has successfully implemented a six-second timeframe to examine psycho-physiological responses to media content features (Lang, 1998). All video clips included people because manipulating the belief that content represented reality or fantasy seemed to have the most impact for social content. Preceding each six-second clip, a five-second title screen featured the headline "Real People" or "Actors," in large white font centered on a black background. Below the headline, a one-sentence description emphasized the clip showing actual events and people or the constructed, dramatic nature of the clip. For example, "REAL PEOPLE. This clip shows a woman crying" versus "ACTORS. This scene from a movie shows an actress pretending to cry." Consistent with a motivational theory of emotion, half the film clips contained highly arousing content, depicting survival threats and opportunities, such as violence,

death, and erotica, and half the clips depicted low-arousal content with no direct survival implications, such as funerals, people talking, or a man reading to children. Manipulation check pre-testing confirmed that participants who viewed video clips with reversed experimental labels reported no significant differences in their belief of labels of “Real People” and “Actors” as applied to each individual clip. During pre-testing, participants rated the emotional valence and intensity of each clip using a 5 point Self-Assessment Manikin scale (Lang, 1980). A median-split was performed on SAM ratings to divide clips into 4 categories of emotional content.

*Procedure.* Sixteen undergraduates (8 male, 8 female) from a large California university participated in Study 1. All participants saw identical video clips; however, the labels of Actors and Real People were reversed for half the participants. This enabled us to examine within-person responses to Real People versus Actors independent of content. Each participant saw an equal number of clips labeled as fantasy or reality. In each emotional content category, half the clips were labeled Real People and half labeled Actors. The order of presentation of clips was counter-balanced using a Latin-square design. Participants were instructed to read the clip introduction and to think about the introduction while watching the video clip. After viewing the clip, participants were instructed to rate the clip in terms of how it made them feel using the 9-point Self-Assessment Manikin (SAM) scale, (Lang, 1980). The SAM is largely culture-free and has assessments of valence and arousal that have been shown to correlate .9 and above with semantic differential scales that measure the same dimensions (Lang, Bradley, & Cuthbert, 1997). Video clips were projected on a 120 inch screen 6 feet from the participant in a darkened room. Heart rate and skin conductance data were collected for each clip presentation, including a 10-second baseline immediately preceding the clip during which participants viewed a black screen, a 5-second clip introduction, and the six second video clip. Following each video clip,

participants had 12 seconds to rate the clip. Physiological data collected during the SAM survey was not used in the analysis. The entire duration of the stimuli was 22 minutes. After viewing the stimuli, participants were debriefed and received compensation for their participation.

*Physiological Recording.* Physiological signals were recorded using a Thought Technology ProComp Infiniti module linked to a PC computer. Heart rate was recorded using a blood volume pulse detection sensor placed on the index finger. Skin conductance was recorded in micro Siemens (uS) using standard Ag/AgCl electrodes placed on the volar surface phalange region of the subject's non-dominant hand. The heart rate signal was sampled at a rate of 2058 times per second, and skin conductance at 256 times per second. The data were converted offline to 8 samples per second for statistical analysis. Artifacts were defined as values outside 2 standard deviations for each individual and replaced with the mean of the surrounding values. Baseline scores for heart rate and skin conductance levels were calculated as the average of the 5-sec period preceding each clip introduction. Baseline scores were subtracted from each time-point during the clip introduction and video to produce change scores for statistical analyses. Following the recommendation of Dawson, Schell and Filion (2000), skin conductance scores were converted to percent change from baseline to reflect the magnitude of deviation from each individual's unique baseline.

## Results

*Self-reported Emotional Valence and Intensity.* Two repeated measures ANOVAs were conducted to examine the effect of reality labels and clip content on self-reported arousal and valence ratings of clips. Clip content had a significant main effect on self-reported arousal in the predicted direction,  $F(1, 15) = 30.388, p = .001, \eta_p^2 = .782$ ; low arousal content  $M = 2.619, SE = .279$ , high arousal content  $M = 3.997, SE = .399$ . Labels of Real People versus Actors also had a

significant effect on self-reported arousal,  $F(1, 15) = 8.307, p = .011, \eta_p^2 = .356$ , Real People  $M = 3.541, SE = .355$ , Actors  $M = 3.075, SE = .327$ . The interaction was not significant,  $F(1, 15) = 2.683, p = .122, \eta_p^2 = .152$ ; low arousal real content  $M = 2.744, SE = .303$ , low arousal fictional content  $M = 2.494, SE = .274$ , high arousal real content  $M = 4.338, SE = .437$ , high arousal fictional content  $M = 3.656, SE = .400$ . For self-reported valence ratings, clip content had a significant main effect in the expected direction, indicating low arousal clips were more positive and high arousal clips more negative,  $F(1, 15) = 8.825, p < .010, \eta_p^2 = .370$ ; low arousal content  $M = 4.850, SE = .116$ , high arousal content  $M = 4.619, SE = .107$ . Labels of Real People versus Actors had a significant effect on self-reported valence, indicating that clips labeled Actors were more positive,  $F(1, 15) = 11.686, p = .004, \eta_p^2 = .438$ , Real People  $M = 4.591, SE = .112$ , Actors  $M = 4.878, SE = .114$ . The significant interaction indicated that self-reported valence for clips labeled real people versus actors differed most for high arousal content,  $F(1, 15) = 5.104, p = .039, \eta_p^2 = .254$ ; low arousal real content  $M = 4.794, SE = .127$ , low arousal fictional content  $M = 4.906, SE = .121$ , high arousal real content  $M = 4.388, SE = .134$ , high arousal fictional content  $M = 4.850, SE = .121$ .

*Physiological Responses.* Repeated measures analyses were conducted on heart rate and skin conductance levels to analyze the effects of three factors: reality status (Real People/Actors) x arousing content (high/low) x time (89 levels). The Huynh-Feldt correction was applied to all degrees of freedom from within-subjects factors in which the assumption of sphericity was violated. Figure 1 shows resulting skin conductance levels. There were no significant main effects on skin conductance level due to Label,  $F(1,15) = .705, p = .414, \eta_p^2 = .045$ , Real People  $M = -.004, SE = .005$ ; Actors  $M = -.009, SE = .005$ , Arousing content,  $F(1,15) = .004, p = .950, \eta_p^2 = .000$ , Low Arousal  $M = -.006, SE = .005$ , High Arousal  $M = -.007, SE = .005$ , or Time,  $F$

(1.554,23.312) = 1.852,  $p = .184$ ,  $\eta_p^2 = .110$ . There was a significant interaction between Label and Arousal,  $F(1,15) = 5.374$ ,  $p = .035$ ,  $\eta_p^2 = .264$ . As Figure 1 indicates, the interaction is due to increased skin conductance levels for highly arousing content labeled Real People ( $M = -.000$ ,  $SE = .006$ ) versus Actors ( $M = -.013$ ,  $SE = .005$ ), whereas for low-arousal content, skin conductance levels did not differ as much according to labels of Real People ( $M = -.008$ ,  $SE = .006$ ) versus Actors ( $M = -.005$ ,  $SE = .007$ ). The interaction between Arousing content and Time showed a trend in the predicted direction, but did not reach significance,  $F(1.691, 25.358) = 3.248$ ,  $p = .063$ ,  $\eta_p^2 = .178$ , indicating the effect of clip content on sympathetic arousal emerged over time. The interaction between Reality and Time was not significant,  $F(2.264, 33.961) = 1.060$ ,  $p = .365$ ,  $\eta_p^2 = .066$ . The significant three-way interaction for Reality, Arousal and Time indicated that over the course of the clip presentation, skin conductance maintained highest levels for highly arousing content labeled as Real People,  $F(2.664, 39.958) = 3.004$ ,  $p = .047$ ,  $\eta_p^2 = .167$ . Figure 2 shows average heart rate changes for each condition during the clip introduction (seconds 0-5) and video (seconds 6-11). The main effect of clip label was significant,  $F(1,15) = 5.029$ ,  $p = .040$ , indicating that heart rate relative to baseline maintained higher levels for clips labeled Real People ( $M = -1.134$ ,  $SE = .301$ ) as compared to Actors ( $M = -1.880$ ,  $SE = .416$ ,  $\eta_p^2 = .251$ ). Time showed a significant main effect on heart rate,  $F(2.3, 34.498) = 11.186$ ,  $p = .000$ ,  $\eta_p^2 = .427$ , indicating significant deceleration across conditions over the course of the 11 seconds. The main effect of arousing content on heart rate was not significant,  $F(1,15) = 2.756$ ,  $p = .118$ ,  $\eta_p^2 = .027$ , Low Arousal Clips  $M = -1.779$ ,  $SE = .335$ ; High Arousal Clips  $M = -1.235$ ,  $SE = .388$ . None of the interaction terms were significant: Label x Time,  $F(24.695, 29.999) = .823$ ,  $p = .561$ ,  $\eta_p^2 = .052$ ; Arousal x Time,  $F(5.974, 89.613) = 1.315$ ,  $p = .259$ ,  $\eta_p^2 = .081$ , Label x

Arousal,  $F(1,15) = .126, p = .727, \eta_p^2 = .008$ , Label x Arousal x Time,  $F(6.291, 94.369) = 1.355, p = .239, \eta_p^2 = .083$ .

### Discussion

Our first hypothesis was that clips judged as highly arousing during pre-testing and showing content with strong survival implications would elicit higher levels of skin conductance and heart rate acceleration, indicating increased activation of motivational systems and preparation for appetitive or defensive behaviors. In support of H1, skin conductance showed a trend of heightened levels over time and self-reported arousal was higher for highly arousing content. Self-reported valence ratings indicated that high arousal clips were more negative than low arousal clips, replicating pre-test results. Content did not show a significant effect on heart rate. However, this may be due to the negative valence of highly arousing video clips. Heart rate has been shown to decelerate in response to negative content (Lang et al., 1993, Bradley et al., 2001a). Thus, while sympathetic arousal contributed to heart rate acceleration, the parasympathetic influence may have contributed to deceleration, indicating increased perceptual processing and sensory intake (Bradley et al., 2001a).

Our second hypothesis was that clips believed to show real people would elicit increased activation of motivation systems and preparation for appetitive or defensive behaviors, indexed by higher levels of skin conductance and heart rate acceleration. In support of H2, reality labels and content had an interactive effect on skin conductance. Over the course of the clip presentation, skin conductance maintained highest levels for highly arousing content believed to show real people. Thus, the belief that video clips showed real people instead of actors increased preparation for action only for highly arousing segments with significant survival implications (e.g. violence and erotica). For video clips showing content of little significance to survival, the

perception of reality did not affect skin conductance levels. Self-reported arousal and valence ratings indicated that the subjective emotional experience of viewing real people was more intense and negative than viewing Actors. Finally, clips labeled as real people produced higher mean heart rate levels than the same clips labeled as actors. Because heart rate is influenced by sympathetic and parasympathetic systems, acceleration while viewing high arousal content is at least partially due to increased sympathetic arousal. The main effect suggests that even for low arousal content, for which reality labels did not cause significant differences in sympathetic arousal, labels of actors contributed to heart rate deceleration, indicating increased perceptual processing and sensory intake for clips labeled actors. Although post-hoc explanations for physiological data should be taken with caution, this result may reflect ascribing meaning and inferring intent theoretically involved in processing symbolic content, (Salomon, 1994). Importantly, content was held constant across conditions, so it was only the reality labels and the presumed belief of viewing real people that caused these effects.

## STUDY 2

### Methods

*Stimuli.* We extended the clip set used in Study 1 to reach a total of 80 six-second video clips. All video clips were selected from obscure fictional and documentary films at the university library for their ambiguous nature (see Table 2 for criteria). Manipulation check pre-testing confirmed that participants showed no significant differences in their own belief and their belief that others would believe the experimental labels of “Real People” and “Actors” as applied to each individual clip. In pre-testing, participants rated clips using SAM, the self-assessment manikin scale (Lang, 1980). The nine-point SAM scale is largely culture-free and has assessments of valence and arousal that have been shown to correlate .9 and above with semantic

differential scales that measure the same dimensions (Lang, Bradley, & Cuthbert, 1997). As shown in Table 3, the 80 clips were grouped into 8 blocks of 10 clips based on median splits of SAM valence and arousal, creating 4 high arousal blocks and 4 low arousal blocks. Valence was not distributed equally; low arousal content tended towards positive valence and high arousal content tended towards the negative. Arousal and valence pre-test ratings for the eight blocks of video stimuli are presented in Table 3. To examine within-subject differences in responding to Real People versus Actors, each subject saw forty high arousal video clips, half labeled Real People and half labeled Actors, and forty low arousal clips, half labeled Actors and half labeled Real People. The labels were presented in alternating blocks, (i.e. ten clips of Real People followed by ten clips of Actors). To ensure that within-subject responses to reality versus fiction were independent of content, labels were reversed for half the participants. In other words, two versions of the stimuli set were created: video clips labeled “Real People” in set A were labeled “Actors” in set B and vice versa. Thus, all participants viewed identical video clip content, and the only manipulation was the participant’s belief that the clip represented Real People or Actors. Blocks were rotated in a latin-square design to control for order effects.

*Procedure.* Sixteen undergraduates were recruited from communications courses at a large private university in California, (9 male, 7 female). Participants received course credit and a twenty-five dollar gift certificate to an online bookstore as compensation. Participants were randomly assigned to view stimuli set A or B, which contained identical content with reversed labels of “Real People” and “Actors.” Participants provided informed consent upon entering the laboratory and sat at a desk approximately eight feet from an eight by six foot projection screen in the darkened laboratory room. A small lamp behind the participant provided sufficient light for completing SAM ratings. The experimenter attached the physiological sensors and explained

to the participant that s/he would watch eighty six-second video clips, which would last approximately 47 minutes. Participants were instructed to read each title screen, watch the video, then rate the clip on the SAM scale in terms of how the video made them feel. Participants had a 12 second period to rate the clip during which they would see an orange dot on the screen. A 10 second baseline preceded each clip presentation, during which a black video screen was shown. Labels were interspersed on blocks such that participants viewed 10 clips of Real People, followed by 10 clips of Actors, followed by 10 clips of Real People, etc. In Study 2, title screens were 6 seconds to allow sufficient time for physiological responses that may occur while reading the labels. After viewing the film clips, participants were debriefed and received compensation for their participation.

*Physiological Recording.* Physiological signals were recorded using a Thought Technology ProComp Infiniti module linked to a PC computer. Heart rate was recorded using a blood volume pulse detection sensor placed on the index finger. Skin conductance was recorded in micro Siemens (uS) using standard Ag/AgCl electrodes placed on the volar surface phalange region of the subject's non-dominant hand. The heart rate signal was sampled at a rate of 2058 times per second, and skin conductance at 256 times per second. The data were converted offline to 8 samples per second for statistical analysis. Artifacts were defined as values outside 2 standard deviations for each individual and replaced with the mean of the surrounding values. Baseline scores for heart rate and skin conductance levels were calculated as the average of the 5-sec period preceding each clip introduction. Baseline scores were subtracted from each time-point during the introduction and video to produce change scores for statistical analyses. Following the recommendation of Dawson, Schell and Filion (2000), skin conductance scores were converted to percent change from baseline to reflect the magnitude of deviation from each

individual's unique baseline. Skin conductance and heart rate measures were averaged at across participants each time point for each of four cells: Real People-High Arousal, Actors-High-Arousal, Real People-Low Arousal, and Actors-Low Arousal. RSA measures were calculated using CMETX, a freely available program for measuring heart rate variability (Allen, Chambers, Towers, 2007). RSA statistics were calculated for each 12 second period during which a title screen and clip were shown and for each 10 second baseline. Each data segment also included twelve seconds of IBI data immediately preceding and following the segment of interest as a buffer that is necessary for the CMETX algorithm but not included in the RSA statistic. RSA change was calculated by subtracting baseline RSA, averaged over 20 baselines in each condition, from average RSA while watching 20 title screens and clips in each condition.

## Results

*Self-reported Emotional Intensity and Valence.* Two repeated measures ANOVAs were conducted to examine the effect of reality labels and clip content on self-reported arousal and valence ratings of clips. Clip content had a significant main effect on self-reported arousal in the predicted direction,  $F(1, 15) = 38.296, p = .000, \eta_p^2 = .719$ ;  $M = 3.133, SE = .378$  for low arousal content,  $M = 4.677, SE = .460$  for high arousal content. Labels of Real People versus Actors had no main effect on self-reported arousal,  $F(1, 15) = .799, p = .385, \eta_p^2 = .051$ , Real People  $M = 3.960, SE = .397$ , Actors  $M = 3.850, SE = .416$ . The interaction was not significant,  $F(1, 15) = 1.589, p = .227, \eta_p^2 = .096$ ; low arousal real content  $M = 3.272, SE = .380$ , low arousal fictional content  $M = 2.994, SE = .383$ , high arousal real content  $M = 4.648, SE = .442$ , high arousal fictional content  $M = 4.706, SE = .505$ . For self-reported valence ratings, clip content had a significant main effect in the expected direction, indicating low arousal clips were more positive,  $F(1, 15) = 26.259, p = .000, \eta_p^2 = .897$ ; low arousal content  $M = 3.770, SE = .130$ ,

high arousal content  $M = 5.051$ ,  $SE = .062$ . Labels of Real People versus Actors had no main effect on self-reported valence,  $F(1, 15) = .626$ ,  $p = .441$ ,  $\eta_p^2 = .040$ , Real People  $M = 4.351$ ,  $SE = .119$ , Actors  $M = 4.470$ ,  $SE = .107$ . The interaction was not significant,  $F(1, 15) = .279$ ,  $p = .605$ ,  $\eta_p^2 = .018$ , low arousal real content  $M = 5.034$ ,  $SE = .080$ , low arousal fictional content  $M = 5.068$ ,  $SE = .061$ , high arousal real content  $M = 3.668$ ,  $SE = .205$ , high arousal fictional content  $M = 3.872$ ,  $SE = .194$ .

*Skin Conductance Level.* Baselines were calculated by averaging five seconds of baseline data immediately preceding each video clip, allowing 5 seconds for the effect of the previous clip to decay. To test the effect of perceived realism on preparation for action, we analyzed skin conductance data with a 2 (Real People, Actors) x 2 (High Arousal, Low Arousal) x 97 (Time) repeated measures analysis of variance (ANOVA). The Huynh-Feldt correction was applied to all degrees of freedom from within-subjects factors in which the assumption of sphericity was violated. Figure 3 shows resulting skin conductance levels. Labeling clips as Real People versus Actors had a significant main effect of on skin conductance level,  $F(1,15) = 4.731$ ,  $p = .046$ ,  $\eta_p^2 = .240$ . As expected, clips labeled Real People ( $M = -.007$ ,  $SE = .004$ ) elicited higher levels of skin conductance than clips labeled Actors ( $M = -.012$ ,  $SE = .004$ ). Arousing content also had a significant effect on skin conductance level in the predicted direction,  $F(1,15) = 5.388$ ,  $p = .035$ ,  $\eta_p^2 = .264$ . High Arousal Clips ( $M = -.007$ ,  $SE = .004$ ) elicited higher skin conductance levels than Low Arousal Clips ( $M = -.013$ ,  $SE = .004$ ). Time did not have a significant effect on skin conductance level,  $F(1.642, 24.635) = 1.548$ ,  $p = .217$ ,  $\eta_p^2 = .094$ . There was no significant interaction between Label and Arousal,  $F(1,15) = 1.357$ ,  $p = .262$ ,  $\eta_p^2 = .083$ ; high arousal content labeled Real People  $M = -.003$ ,  $SE = .004$ , Actors  $M = -.010$ ,  $SE = .004$ ; low-arousal content labeled Real People  $M = -.011$ ,  $SE = .005$ , Actors  $M = -.014$ ,  $SE = .004$ . The interaction

between Arousal and Time did not reach significance,  $F(1.455, 21.822) = 2.703, p = .103, \eta_p^2 = .153$ . The interaction between Label and Time did not reach significance,  $F(1.990, 29.848) = 2.455, p = .103, \eta_p^2 = .141$ . The three-way interaction for Label, Arousal and Time was not significant,  $F(2.142, 32.128) = .589, p = .572, \eta_p^2 = .038$ . These results suggest that the realism effect on skin conductance level is independent of content.

*Heart Rate.* To test the effect of perceived realism on preparation for action, we analyzed heart rate data with a 2 (Real People, Actors) x 2 (High, Low Arousal) x 97 (Time) repeated measures analysis of variance (ANOVA). The Huynh-Feldt correction was applied to all degrees of freedom from within-subjects factors in which the assumption of sphericity was violated. Figure 4 shows average heart rate changes during the clip introduction (seconds 0-6) and video (seconds 6-12) for each condition. The main effect of clip label was not significant,  $F(1,15) = .444, p = .515, \eta_p^2 = .029$ , indicating no difference in heart rate relative to baseline for clips labeled Real People ( $M = -3.657, SE = .499$ ) as compared to Actors ( $M = -3.395, SE = .553$ ). The main effect of arousing content on heart rate was not significant:  $F(1,15) = .003, p = .958, \eta_p^2 = .000$ , Low Arousal Clips  $M = -3.539, SE = .536$ ; High Arousal Clips  $M = -3.513, SE = .551$ . Time showed a significant main effect on heart rate,  $F(6.176, 92.638) = 28.839, p = .000, \eta_p^2 = .658$ , indicating heart rate deceleration across conditions over the course of the clip presentation. None of the interaction terms were significant: Label x Time,  $F(5.212, 78.176) = 1.145, p = .344, \eta_p^2 = .071$ ; Arousal x Time,  $F(5.647, 84.699) = .437, p = .842, \eta_p^2 = .028$ , Label x Arousal,  $F(1,15) = .117, p = .737, \eta_p^2 = .008$ , Label x Arousal x Time,  $F(4.007, 60.109) = .756, p = .398, \eta_p^2 = .048$ .

*Heart Rate Variability.* To test the effect of perceived realism on heart rate variability, as an index of emotion regulation, we analyzed RSA data with a 2 (Real People, Actors) x 2 (High,

Low Arousal) repeated measures analysis of variance (ANOVA). Figure 5 shows resulting changes in RSA from baseline for each condition. Clip labels had a significant main effect on heart rate variability,  $F(1, 15) = 8.014, p = .012, \eta_p^2 = .351$ . Contrary to our expectations, clips labeled Real People elicited significantly higher RSA levels ( $M = -.010, SE = .063$ ) than clips labeled Actors ( $M = -.160, SE = .055$ ). Arousing content did not have a significant effect on heart rate variability  $F(1, 15) = 1.388, p = .257, \eta_p^2 = .085$ ; low arousal  $M = -.133, SE = .075$ , high arousal  $M = -.038, SE = .057$ ). The interaction between Label and Arousal was not significant  $F(1, 15) = .043, p = .838, \eta_p^2 = .003$ .

### Discussion

Our first hypothesis predicted that highly arousing content would elicit higher levels of skin conductance and heart rate acceleration, indicating increased activation of motivational systems and preparation for appetitive or defensive behaviors. In support of H1, highly arousing clips elicited increased skin conductance levels and self-reported arousal ratings. Self-reported valence ratings also indicated that high arousal clips were more negative, and low arousal clips more positive; however, heart rate did not show any differences according to clip content.

Our second hypothesis predicted that clips labeled "Real People" would elicit higher levels of skin conductance and heart rate acceleration indicating increased motivation activation and preparation for action as compared to clips labeled "Actors." In support of H2, reality labels elicited increased skin conductance levels despite the extended time course (47 minutes in Study 2 compared to 22 minutes in Study 1). However, heart rate and self-reported arousal showed no significant difference according to reality labels. Heart rate showed a consistent downward trend over the course of the 12 second presentation, indicating perceptual processing and sensory intake that was undifferentiated across content and label conditions. One possible reason that the

effect of reality labels on heart rate observed in Study 1 did not persist over the extended time course of Study 2 is habituation to the stimuli and/or experimental fatigue. A second possible explanation is that the stimuli did not elicit sufficient levels of motivation activation to warrant mobilization and preparation for action. As described in the Defense Cascade Model (Bradley, Codispoti, Cuthbert & Lang 2001), skin conductance increases linearly, while heart rate decelerates during orienting and attention and then accelerates as action seems increasingly warranted. Thus, although Study 2 provides support that reality labels increase motivation activation, as indicated by skin conductance increased levels, the extended duration of the stimuli seems to reduce the effect, as heart rate remains in the “attention” phase across reality conditions. These data suggest that the effect of real people versus actors on motivation activation lessened over the extended time period of Study 2.

Our third hypothesis tested for emotion regulation during processing of fictional content, indicated by increased heart rate variability, lowered arousal and more positive self-reported valence. Contrary to H3, heart rate variability levels were significantly higher for reality content. Although arousal levels were lower for fictional content, self-reported valence did not differ significantly for clips labeled Real People versus Actors. One explanation for our unexpected results is that higher heart rate variability levels reported in Butler, Wilhelm and Gross, (2006) reflect increased central autonomic network activity involved in assisting active emotion regulation efforts after participants were instructed to engage in emotion regulation. As the present study did not instruct participants to engage in emotion regulation, our findings suggest that under conditions in which participants are passively viewing a film, content labeled as Real People actually involves increased emotion regulation.

## General Discussion

Previous research has shown skin conductance increases reflect increased preparation for appetitive or defensive behavior. The results of the present study show that during processing content perceived as increasingly real, skin conductance increases reflect increased preparation for appetitive or defensive behavior. These results suggest that content perceived as reality activates motivational systems to a greater extent than fictional content. In the 22 minute version of the stimuli used in Study 1, realism increased skin conductance and heart rate for stimuli clips depicting high-arousal content with strong motivational associations, i.e. “primary reinforcers.” Study 2 showed increased skin conductance for various types of emotional content perceived as real, (high arousal-negative and low-arousal-positive) over the course of a 47 minute presentation. The results of Study 1 and 2 support our hypothesis that content perceived as real elicits greater motivation activation and preparation for action than equivalent content perceived as dramatic. The findings suggest that emotional intensity, manifested by sympathetic arousal, can be used as an indirect measure of the perception that media represent real life. The results also suggest that motivation activation is an important process in media realism effects. While participants showed increased skin conductance responses to fictional media as though media represented real life, skin conductance increases are greater when individuals perceive media content as real. Thus, although people do respond emotionally to media as though it represented real life, the distinction between real life and fiction is not meaningless.

The main limitation of the present studies is the artificial nature of the experimental context. Heart rate data showed a downward trend across the clip presentation, suggesting that participants may have lost interest in the stimuli. Even if participants were bored, the reality labels still induced increased arousal. Importantly, content was held constant across conditions, so it was only the reality labels and the presumed belief of viewing real people that caused

effects. However, in the real world, people do not necessarily think about the reality status of media, and the judgment of media as real or fictional is rarely clear cut. As outlined in Table 1, reality judgments are the product of a complex interaction of features in the medium, the message and the individual. This experiment shows effects on motivation activation and preparation for action when viewers perceive media as increasingly like real life, a belief which is artificially induced in the present study. However, we believe the results of the present study generalize to any situation in which individuals experience the psychological state of presence, a state “in which virtual objects are experienced as actual objects,” (Lee, 2004). Features of media shown to induce the subjective perception that media represent reality include vividness and interactivity (Steuer, 1999) and typicality of content (Shapiro & Chock, 2003). Individual differences such as age (Flavell et al., 1990; Jaglom & Gardner, 1981; Conroy & Freund, 1989; Potter, 1988; Dorr, 1983), expectations (Hawkins, 1977), prior knowledge (Green, 2004) and motivations (Rubin, 1981; Potter, 1992) have also been shown to influence subjective perceptions of media realism.

Episodic memory, which refers to the ability to learn and consciously remember new experiences, is enhanced by emotional arousal, (Bohannon, 1988; Heuer & Reisberg, 1990; Cahill, Haier, Fallon, Alkire, Tang, Keator, Wu, & Mc Gaugh, 1996; La Bar & Phelps, 1998; Bradley, Greenwald, Petry, & Lang, 1992; Christianson & Fallman, 1990; McGaugh, 2000; Schupp, 2004 #99). The augmentation of episodic memory by emotion increases the probability that information that is significant for survival is kept in mind (McGaugh, 2000). Future research may test whether the indirect measure of arousal as an index of perceived realism and motivation activation provide an explanatory mechanism for findings that link perceived realism with memory, social learning and persuasion. For example, highly transported readers are less likely

to disbelieve story claims and more likely to show beliefs consonant with story conclusions (Green & Brock, 2000). Increased presence experienced in response to a media presentation has been shown to increase source credibility (Bracken, 2005) and brand choice confidence (Botta & Bracken, 2002). Perceptions of media violence as increasingly realistic consistently increase aggressive behavior among adults (Berkowitz & Alioto, 1973; Geen, 1975; Geen & Rakosky, 1973; Thomas & Tell, 1974) and children (Atkin, 1983; Feshbach, 1972; Sawin, 1981).

Relative to human evolution, media have been part of the environment for about a “nanosecond,” so the human brain did not evolve to process perceptually compelling symbolic representations (Reeves & Nass, 1996). Thus, when participants are presented with a symbol that does not actually present threatening consequences, they still prepare for mobilization, perhaps instinctively. One reason our manipulation may have meaning is that symbols perceived as “Real People” are which necessarily and directly linked to real world referents and imply different consequences than symbols perceived as “Actors,” which are not necessarily or directly linked to real world referents. We presume it is the different consequences implied by portrayals of Actors versus Real People that influence viewers’ physiological responses; however, the mechanism for how viewers may incorporate different implied consequences into an emotional response remains unclear. Heart rate variability results obtained in the present study falsify the hypothesis that viewers actively engage in cognitive reappraisal when viewing fictional content in order to regulate physiological responses, at least under the passive viewing conditions of the present study. On the contrary, heart rate variability results suggest that the central autonomic network is more actively engaged when viewing content perceived as reality. It is important to understand how the different consequence structures implied by symbols and real life may inform emotional responses and behaviors. Future research may test whether emotional responses induced by the

perception of realism are contingent on the perception of self-relevant consequences and whether survival implications are consciously or unconsciously assessed as part of this process.

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Table 1. Factors that influence media realism perceptions

| Medium   | Message   | Individual Factors   |
|--|---|--|
| <ul style="list-style-type: none"> <li>• Vividness, (Steuer, 1999)</li> <li>• Interactivity, (Steuer, 1999)</li> </ul> | <p>Content Features</p> <ul style="list-style-type: none"> <li>• Explicit labels/frames, (Geen, 1973, Geen &amp; Rakosky, 1975)</li> <li>• Typicality, (Shapiro &amp; Chock, 2003)</li> <li>• Plausibility &amp; Probability, (Busselle &amp; Greenberg)</li> <li>• Genre cues (See Table 2)</li> </ul> | <p>Information processing abilities:</p> <ul style="list-style-type: none"> <li>• Age (Flavell et al., 1990, Cantor &amp; Wilson, 1984)</li> <li>• Critical processing (Quintero-Johnson &amp; Busselle, 2004; Wilson &amp; Busselle, 2004; Zhang et al., 2007; Busselle, Ryabovolova, &amp; Wilson, 2004)</li> </ul> <p>Motivations:</p> <ul style="list-style-type: none"> <li>• Utility (Buselle &amp; Greenberg, 2000)</li> <li>• Escapism (Prentice &amp; Gerrig, 1999)</li> <li>• Transportation, (Green, 2004).</li> </ul> <p>Prior Knowledge/Expectations (Hawkins, 1977; Green, 2004)</p> |

Table 2. *Video clips in the stimuli set were of ambiguous reality status, excluding the following formal and content features that were found to influence media realism perceptions.*

| Reality video clips   | Dramatic video clips  |
|---|---|
| <i>Formal Features</i>  |   |
| <ul style="list-style-type: none"> <li>• Hand-held camera movement</li> <li>• Eye level camera angles</li> <li>• Natural lighting &amp; ambient sounds</li> <li>• Visible production equipment, (e.g. microphone, stage, artificial lighting)</li> <li>• Consistency between format, time period and context, i.e. pixilation in digital video or warbled tape lines in VHS indicate degradation common in home video footage in the last decade; spots, lines, blurriness and overexposure indicate degradation of 16mm and 8mm vintage formats; black and white film is common prior to the 1960s.</li> </ul> | <ul style="list-style-type: none"> <li>• Dollied camera movement, for example moving upwards into high angles</li> <li>• "Hidden" or illogical camera angles, (why would a camera be there?)</li> <li>• Artificial lighting (especially in dark scenes)</li> <li>• High quality audio: background music, no irrelevant ambient sounds.</li> </ul> |
| <i>Content Features</i>   |   |
| <ul style="list-style-type: none"> <li>• The camera does not always catch the beginning of an action</li> <li>• Recognizable people and places from the real world, (politicians, city signs, etc)</li> <li>• Clothes, hair and makeup seem natural, un-stylized.</li> </ul>  | <ul style="list-style-type: none"> <li>• Recognizable actors</li> <li>• Clothes, hair and makeup appear stylized. Period dramas lack vintage format cues, or the period is impossible to film, i.e. Renaissance era.</li> <li>• Impossible or highly unlikely events captured in high quality film seem staged using special effects.</li> </ul>  |

Table 3. Study 2 SAM Ratings, (each Block = 10 video clips).

| Study 2 SAM Ratings       |                   |                |                   |   |                              |                |
|---------------------------|-------------------|----------------|-------------------|---|------------------------------|----------------|
| Pre-test Ratings (N = 30) |                   |                |                   |   | Participant Ratings (N = 16) |                |
| Valence - Real            | Valence - Fiction | Arousal - Real | Arousal - Fiction | Block# - Description (Group Labels)         | Valence M / SE               | Arousal M / SE |
| 3.994                     | 4.510             | 3.229          | 2.022             | 1 – Low-Negative (A = Real, B = Fiction)    | Clips 1-40 (avg.)            |                |
|                           |                   |                |                   |   | 5.05 / .06**                 | 3.13 / .38**   |
| 5.4                       | 5.527             | 2.011          | 2.922             | 2 – Low-Positive (A = Fiction, B = Real)    | Clips 1 – 40: Real           |                |
| 5.929                     | 5.6               | 3.882          | 2.5               | 3 – Low-Positive (A = Real, B = Fiction)    | 5.03 / .08                   | 3.27 / .38     |
|                           |                   |                |                   |   | Clips 1 – 40: Fiction        |                |
| 4.833                     | 4.735             | 2.9            | 3.735             | 4 – Low-Neutral (A = Fiction, B = Real)     | 5.07 / .06                   | 2.99 / .38     |
| 5.564                     | 5.456             | 5.418          | 3.178             | 5 – High – Positive (A = Real, B = Fiction) | Clips 41-80 (avg.)           |                |
| 3.867                     | 3.665             | 3.189          | 4.9               | 6 – High – Negative (A = Fiction, B = Real) | 3.77 / .13**                 | 4.68 / .46**   |
| 2.618                     | 3.5               | 5.135          | 3.378             | 7 – High – Negative (A = Real, B = Fiction) | Clips 41 – 80: Real          |                |
|                           |                   |                |                   |   | 3.67 / .20                   | 4.65 / .44     |
| 2.521                     | 2.941             | 4.533          | 5.894             | 8 – High – Negative (A = Fiction, B = Real) | Clips 41 – 80: Fiction       |                |
|                           |                   |                |                   |   | 3.87 / .19                   | 4.71 / .51     |

\* =  $p < .05$ , \*\* =  $p < .01$

Figure Captions

*Figure 1.* Study 1. Skin conductance level changes in response to high and low arousal film clips labeled as “Real People” or “Actors”

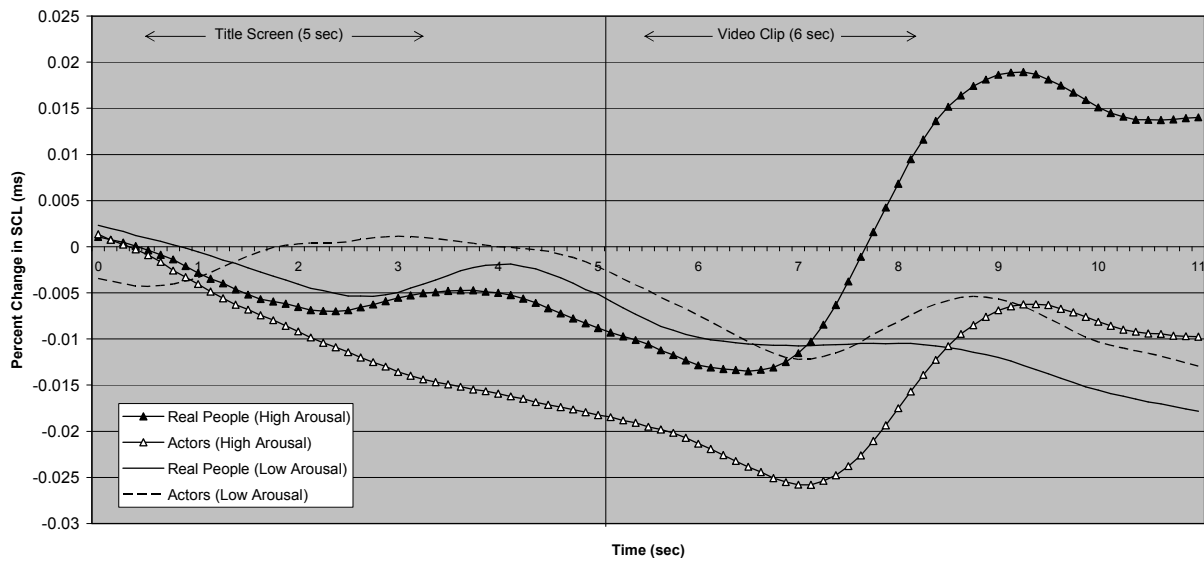
*Figure 2.* Study 1. Heart rate changes in response to high and low arousal film clips labeled as “Real People” or “Actors”

*Figure 3.* Study 2. Skin conductance level changes in response to high and low arousal film clips labeled as “Real People” or “Actors”

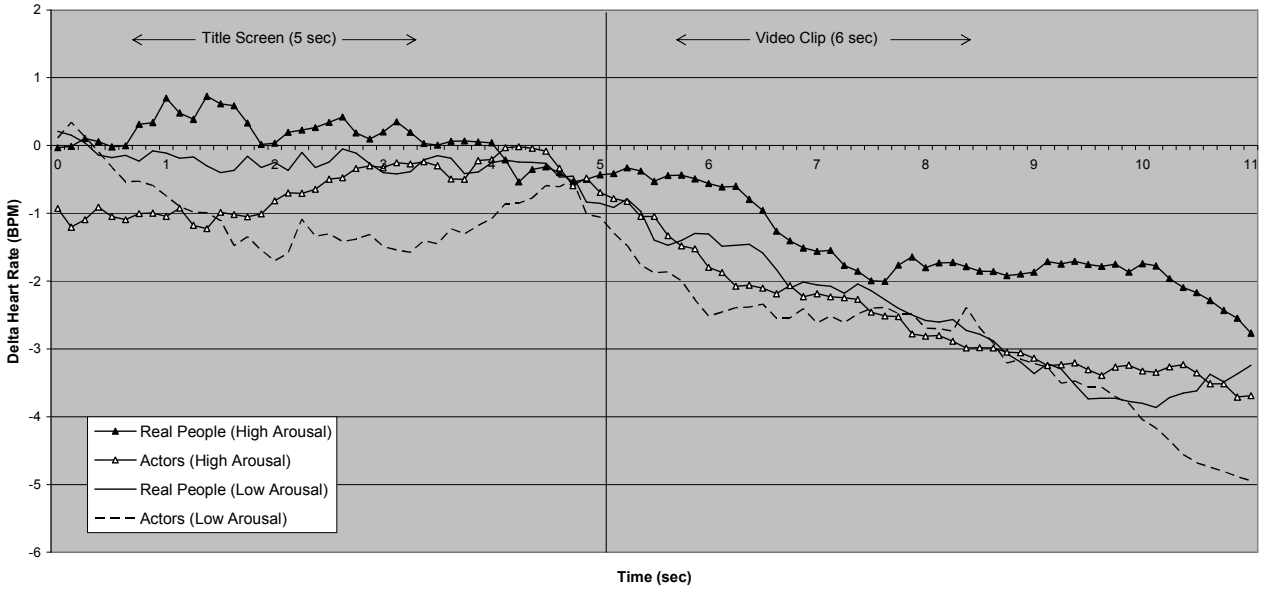
*Figure 4.* Study 2. Heart rate changes in response to high and low arousal film clips labeled as “Real People” or “Actors”

*Figure 5.* Study 2. Heart rate variability

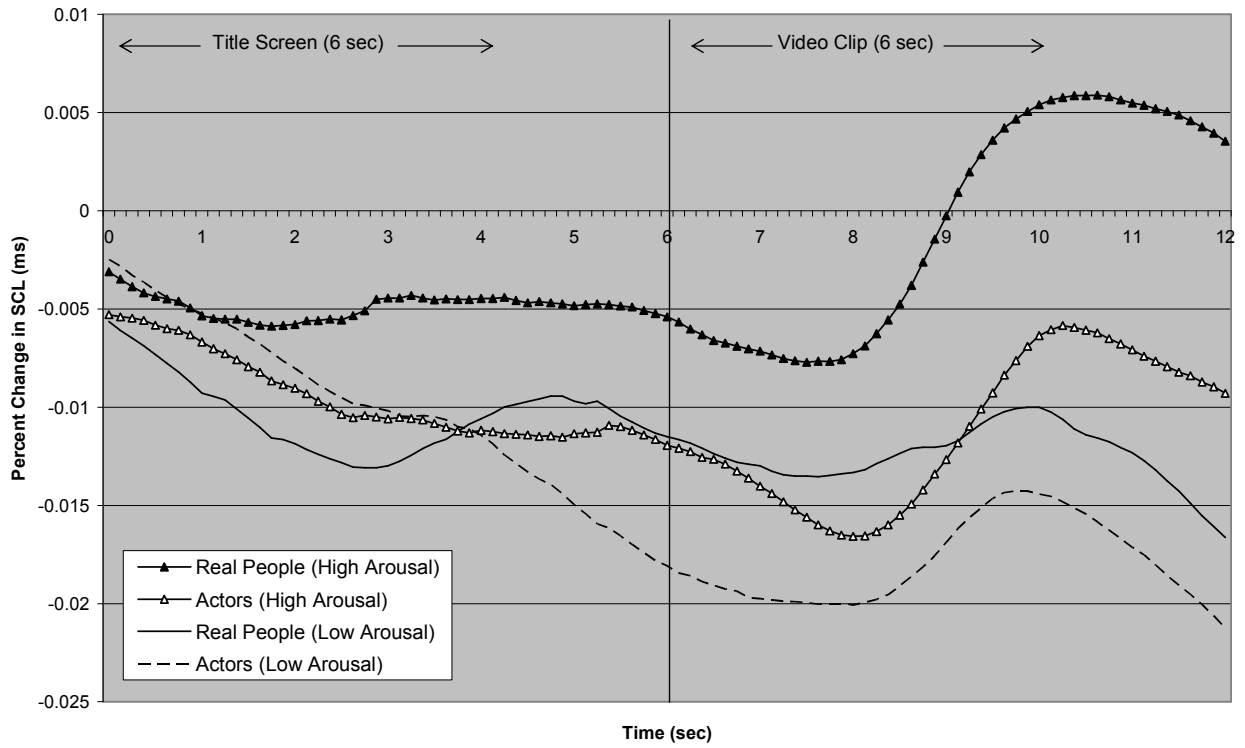
Study 1 Skin Conductance Responses to Video Clips Labeled Real People or Actors



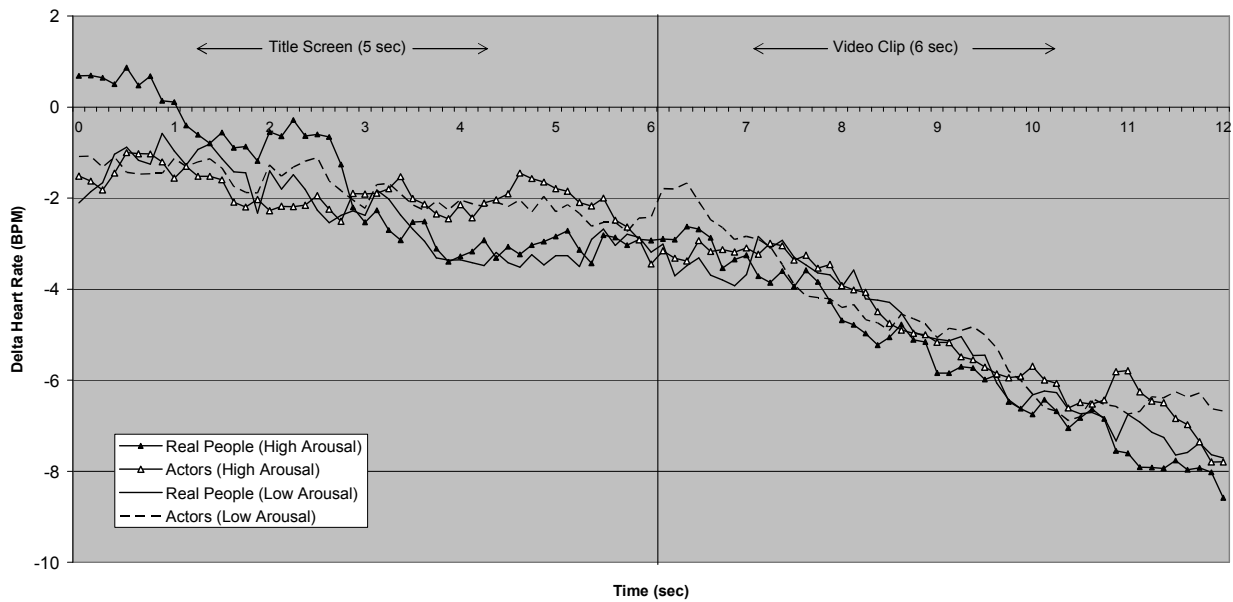
Study 1 Heart Rate Response to Video Clips Labeled as Real People or Actors



Study 2 Skin Conductance Responses to Video Clips Labeled Real People or Actors



Study 2 Heart Rate Response to Video Clips Labeled Real People or Actors



### Heart rate variability while viewing video clips labeled Real People versus Actors

