Computers in Human Behavior 32 (2014) 32–39

Contents lists available at ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

Receptive to bad reception: Jerky motion can make persuasive messages more effective

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ARTICLE INFO

Article history:
Available online 15 December 2013

Keywords:
Advertising
Cognition
Computer animation
Decision making
New media
Physiological measures

ABSTRACT

When used deliberately in television and film, jerky motion captures attention. However, it can be distracting in the movements of characters in digital video. To what extent does this kind of jerkiness influence message processing? Based on a limited-capacity model of message processing, jerky character motion was predicted to increase compliance to a persuasive message. The present experiment manipulated the jerkiness of an actor's movements in a computer-delivered video to examine its effect on responses to a hypothetical medical scenario. Jerkiness, whether subtle or obvious, increased self-reported compliance. It also decreased heart rate variability, indicating attentional mediation. Though counterintuitive, these findings indicate that jerky character motion can make computer-mediated messages more persuasive.

1. Introduction

In contemporary film and television, jerky motion is used to catch an audience's attention, for example, to maintain interest despite environmental distractions (Bordwell, 2002; Cutting, Brunick, DeLong, Iricinschi, & Candan, 2011; Cutting, DeLong, & Nothelfer, 2010; DeLong, Brunick, & Cutting, 2012). Three prominent types of jerky motion are abrupt reframing, rapid cuts, and actors' idiosyncratic movement. Reframing is performed most often during handheld recording, whereas rapid cuts (i.e., discontinuous camera view changes) are added during postproduction editing. Occasionally, jerkiness is added to actors' movements (e.g., Max Headroom). However, when jerky motion is applied inexpertly or too often, it may cause queasiness and decrease how accurately scenes are recognized (Bordwell, 2007; Ebert, 2007; Garsoffky, Huff, & Schwan, 2007).

Because the production and distribution of online digital media is cheaper and easier than film and television, its technical quality varies considerably. As a result, jerky motion occurs more frequently in online videos, especially in actors' movements. When it occurs, it is more likely to be considered an unintended technical flaw (Hilderbrand, 2007).[1] This makes it more difficult to interpret the intention behind jerky motion. For example, when a video on YouTube is shaky, the video's creator may be perceived as either an amateur or one unconcerned with steady framing. Jerky motion may be introduced during filming, postproduction (including editing and encoding), and presentation (e.g., because of limitations in a viewer's network connection speed and hardware capabilities; Hartsell & Yuen, 2006; He & Gupta, 2001; Shephard, Ottewill, Phillips, & Collier, 2003).

Jerkiness also affects the perceived quality of online computer games. For example, massively multiplayer online role-playing games and online first-person shooter games rely on frequent and timely updates of players' positions and movements. Without these updates such games may behave erratically. As a result players' digital representations—their avatars—may move less smoothly or even unrealistically, decreasing players' effectiveness and enjoyment (Claypool, Claypool, & Damaa, 2006). In both online video and online gaming, jerkiness may be caused by technology that is buggy, outdated, or both. Therefore, in online digital content, jerky motion is common and often beyond the producer's control.

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[1] Examples of intentional digital distortion exist under names like glitch art and datamoshing (Brown & Kutty, 2012; Menkman, 2011).

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http://dx.doi.org/10.1016/j.chb.2013.11.012

The potential effect of jerky motion on human cognition in processing mediated messages is significant because of the role of animated motion in computer-mediated communication and human–computer interaction. An increasing number of computer interfaces adopt an interaction style that draws on conversations as a metaphor. These interfaces may elicit behavior ordinarily directed toward other people (Nass, Steuer, & Tauber, 1994; Reeves & Nass, 2002; Sproull, Subramani, Kiesler, Walker, & Waters, 1996).[2] Conversation-based computer interfaces also facilitate learning by promoting cognition (Mayer, 2005). Sometimes, conversation-based interfaces are not merely applicable but ideal. They may, for example, support interaction when users can neither read nor type (Nass & Lee, 2001). Human-looking interfaces extend the conversation metaphor of human–computer interaction through graphical embodiment (Cassell, Sullivan, Prevost, & Churchill, 2000). Human-looking interfaces have advanced knowledge in scientific fields including pedagogy and social and cognitive science research (Baylor, 2002; MacDorman & Ishiguro, 2006). Practical benefits of human-looking interfaces include the treatment of social anxiety, the facilitation of remote learning, and the motivation of regular physical exercise (Bailenson et al., 2008; Fox & Bailenson, 2009; Kang & Gratch, 2010). Their promise has already inspired the delivery of educational material using avatars in multiuser game environments (De Lucia, Francese, Passero, & Tortora, 2009; Foster, 2007).

Human-looking interfaces could support decision-making tasks in medicine and other restricted domains. For example, computer medical expert systems can produce desirable patient outcomes (Bennett & Hauser, 2013; International Business Machines Corp., 2013; Lin, Lin, Lin, & Yang, 2009; Yu et al., 1979). Human-looking interfaces could make expert systems more accessible to professionals and to ordinary users. For example, patients may feel less apprehensive when seeking medical advice from a virtual clinician than from a human clinician (Bickmore, Pfeifer, & Jack, 2009; Lisetti, Yasavur, Visser, & Rishe, 2011). Elsewhere, animated agents and avatars have been found useful as aids in real-time 3D visualization and virtual shopping (Lee & Chung, 2005, 2008; Stock et al., 2008).

Social responses may be strongest to computer interfaces that most closely emulate human appearance and behavior (Cassell, Bickmore, Campbell, Vilhjálmsson, & Yan, 2001; Cassell & Tartaro, 2007; MacDorman & Ishiguro, 2006). However, early research suggests virtual encounters will also become more complicated. Specifically, as the interface becomes more humanlike, the interaction, consultation, or educational outcome may depend more on presentational factors like appearance, at least initially (Garau et al., 2003; Holzwarth, Janiszewski, & Neumann, 2006; Keeling, McGoldrick, & Beatty, 2010; Luo, McGoldrick, Beatty, & Keeling, 2006; MacDorman & Ishiguro, 2006; Nowak & Biocca, 2003). Depending on how human likeness is achieved, it could enhance or hinder acceptance of the interaction (Ho, MacDorman, & Pramono, 2008; MacDorman, Green, Ho, & Koch, 2009). Despite this variability, little formal scrutiny has been given to the perception of moving images (Smith, Levin, & Cutting, 2012), and even less to attitudes about animated virtual humans (MacDorman, Coram, Ho, & Patel, 2010). In summary, given the prevalence of jerky motion in online digital media, the potential difficulty of controlling jerkiness, its importance to human–computer interaction, and the relative lack of pertinent empirical data, an investigation of its influence on communication is warranted.

The objective of the present research is to identify technical artifacts, such as jerky motion, that influence the perception of electronically mediated messages. The next section describes how jerky motion could increase attention to a message, thus motivating the experimental hypotheses. Sections follow it on the methods, results, and discussion and conclusion.

2. Gaining compliance with jerky movement

2.1. Automatic responses to jerky movement

Rapid cuts, unsteady cameras, and the motion of onscreen objects can attract media viewers' attention automatically (Detenber, Simons, & Bennett, 1998; Hitchon, Duckler, & Thorson, 1994; Lang, Zhou, Schwartz, Bolls, & Potter, 2000). This effect goes mostly unnoticed when viewers are focused on the narrative (Bordwell, 1984; Saito & Yuka, 2007; Smith & Henderson, 2008). In online digital media, attention is also attracted through animated and pop-up advertisements on websites (Chung, 2007; Diao & Sundar, 2004; Lang, Borse, Wise, & David, 2002).

According to the limited capacity model of motivated mediated message processing (LC4MP; Lang, 2000, 2009), the effect of visual novelty on attention is mediated by an automatic action known as the orienting response, which is believed to facilitate discovery and learning (Sokolov, 1963). An assumption of the present research is that an orienting response is also elicited when perceiving nonhuman jerky motion in a human figure. Biological and nonbiological motion elicit different patterns of brain activity, which cannot be explained merely by motion complexity (Grossman & Blake, 2002; Pelphrey et al., 2003). The ability to recognize human motion is particularly well refined, owing to its usefulness in making inferences about others' intentions (Blake & Shiffrar, 2007; Blakemore & Decety, 2001).

The orienting response can be measured reliably. One physical indicator of an orienting response is bradycardia, a temporary deceleration in heart rate (Graham & Clifton, 1966; Lang, Geiger, Strickwerda, & Sumner, 1993). An evolutionary explanation of bradycardia is that it facilitates homeostasis while deciding how to react to a novel stimulus (Campbell, Wood, & McBride, 1997). Bradycardia during media viewing is caused by an increase in regulatory influence of the parasympathetic nervous system relative to the deregulatory influence of the sympathetic nervous system (Lang, 2009; Lang, Bolls, Potter, & Kawahara, 1999; Quigley & Berntson, 1990; Richards & Casey, 1991). A related indicator of the orienting response is heart rate variability, which decreases during stressful activity (Delaney & Brodie, 2000). In many experiments a decrease in heart rate variability suggests an increase in cognitive effort (reviewed in Lang, Potter, & Bolls, 2009), though it may be more indicative of emotional strain (Nickel & Nachreiner, 2003).

Another set of indicators of the orienting response involves changes in the electrical conductance of skin (electrodermal activity), which varies with activation of the sympathetic nervous system (Lang et al., 1999). Measurement of skin conductance is divided further into measurement of tonic activity and measurement of phasic activity (Stern, Ray, & Quigley, 2001). Increases in tonic activity, measured using the skin conductance level, indicate autonomic arousal (Jacobs et al., 1994). Phasic activity is measured using the frequency of brief spikes in the conductance level, termed skin conductance responses. Although skin conductance responses may be pegged to the precise onset of one or more stimuli, the frequency of nonspecific skin conductance responses also varies with cognitive effort (Nikula, 1991).

2.2. Influence of orienting on automatic resource allocation and attitude formation

The orienting response elicited by rapid cuts causes changes in heart activity and skin conductance, which in turn predict increases

[2] Nevertheless, interacting with social interfaces as if they are humans need not imply a belief that the interfaces *are* human (Mitchell, Ho, Patel, & MacDorman, 2011; Tourangeau, Couper, & Steiger, 2003).