Narrative “Flow”: A model of narrative processing and its impact on information processing, knowledge acquisition and persuasion

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Abstract
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Insofar as remembering narrative information is a necessary first step toward behavior change, the relationship between narrative flow and memory was explored. A sample of young women (n=115) viewed two excerpts from the primetime medical drama, ER, each addressing a relevant health topic – HPV and BRCA1. Segments of these excerpts, previously found to elicit/inhibit narrative flow, served as a basis for comparison. High engagement produced significantly more recall than low engagement periods. Accurate recognition of key health information was greater when information was presented during low engagement periods.

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Dedication

Contrary to most, I’ve never hoped I would grow up to be unlike my mom and dad. They are selfless, and I would like to think they’ve given some of their best qualities to me — a love for learning, a deep respect for education — both formal and informal, an appreciation for people and places of the world. Warmth, compassion, commitment.

To my mom and dad.

I don’t say it often enough. I am a sister. And when you have brothers like I do, that is something to be proud of. I’d like to think that I have supported them, challenged them and embraced them for who they are...because, to be honest, they are two of the most incredible men I know. To my brothers.

I’m a sensitive person, but I know how to laugh at myself. I think this comes from my friends (in-laws included), who have always laughed at me for my shortcomings. Their digs have reminded me that, although I am not perfect, I am loved as though I were.

To my friends.

I believe in miracles. And superheros. I believe that good things happen to good people. I met my husband on the first day of 6th grade. And now during these last days of my 21st (?) grade, I think to myself — our love is a miracle. My husband is my superman. And together, he and I experience something amazing each and every day.

To my husband.

And to my Ashton. You make my heart sing.
ABSTRACT

NARRATIVE "FLOW": A MODEL OF NARRATIVE PROCESSING AND ITS IMPACT ON INFORMATION PROCESSING, KNOWLEDGE ACQUISITION AND PERSUASION

Jean Brechman

Supervisor: Joseph N. Cappella, PhD

The utility of narrative as a powerful communication tool is undisputed. However, within both narrative and media effects literature, there is a general lack of attention afforded to the process through which narrative influences audiences. This dissertation investigates the distinct cognitive and emotional dimensions that comprise one’s narrative flow and comprehension through the development and validation of a process model. In addition to continuous response measurement and stimulated recall interviews, validation efforts included the use of a scaling technique designed to investigate the conditional nature of narrative flow. These efforts provided evidence for the model’s successful characterization of the psychological processes involved in narrative processing.

Insofar as remembering narrative information is a necessary first step toward behavior change, the relationship between narrative flow and memory was explored. A sample of young women (n=115) viewed two excerpts from the primetime medical drama, ER, each addressing a relevant health topic – HPV and BRCA1. Segments of these excerpts, previously found to elicit/inhibit narrative flow, served as a basis for comparison. High engagement produced significantly more recall than low engagement.
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I. Introduction and Specific Aims

In recognition of the media-saturated environment in which we live, it is important to consider the role of media as socialization agents. As acknowledged by the CDC's Office of Communication Entertainment Education Initiative, "The mass media in general, and television in particular, provide enormous amounts of information about health through storylines in entertainment programming. This information may be correct or incorrect, peripheral or central to characters' lives, planned or serendipitous" (Salmon, 2000, p.8). In addition to social networks and community ties, myriad messages reach the public through mass media. Zillman & Vorderer (2000) observe that entertainment has never before been so accessible to so many people, comprising such a significant portion of their leisure time.

Until recently, the general tendency of effects research has been to assume negative effects. A growing body of research, however, recognizes media as a potential tool for education and health promotion (Singhal & Rogers, 1999). Taken together, both perspectives highlight the necessity for increased attention to the role of entertainment media in public health information acquisition.

If media content is, indeed, leaving an impression on viewers, research is needed to understand how that content facilitates cognitive and/or behavioral change in its audience. The research program presented here moves beyond assumptions of effect and investigates key influence mechanisms through which entertainment media
cultivates change. Specific goals of the research include (1) developing and validating a
model of narrative flow, capturing the multi-dimensional process of engagement; and
(2) determining the extent to which narrative flow impacts processing, acquisition of
cancer knowledge and story-consistent belief change.

Increasing our awareness and understanding of the relationship between
narrative flow and information processing can inform the development of programming.
For example, it is likely that critical health information is better remembered when it is
presented within a period of low engagement. While this study assumes a public health
orientation, specifically focusing on cancer outcomes, an area of increasing concern to
public health officials and health practitioners, findings may also extend beyond the
context of entertainment television to the broader scope of message design and
evaluation.
II. Background and Significance

Elucidation of the mechanisms by which one’s exposure to messages is linked with individual perception can improve our understanding of the utility of entertainment media as a strategy for promoting public health. This dissertation explores, more specifically, cancer outcomes and behavior.

B.1) Entertainment as education? Efforts and empirical evidence for effects

In addition to health campaigns (Hornik, 2002; Rice & Atkin, 2001), advertising (Macklin & Carson, 1999) and news coverage (Yanovitsky, 2002; Yanovitzky & Stryker, 2001), entertainment media has been recognized as an agent for social change. Until recently, communication scholars largely neglected the entertainment function of entertainment media (Katz & Foulkes, 1962; Sutton-Smith, 1988). Given the trend toward global entertainmentization¹, however, the study of entertainment media and genre has increased exponentially.

Fisch, Truglio & Cole (1999) distinguish between media content produced purely for entertainment purposes and programming developed with the intention of providing instruction (e.g. Sesame Street) or incorporating educational messages into entertainment-oriented storylines (see Singhal & Rogers, 1999). In the former case, entertainment programs are often created with no intention to educate, persuade or

¹ Wolf (1999) refers to the rising tide of entertainment in personal and economic sectors (i.e. retail, dining, travel) as “entertainmentization” of the world. Some examples of this trend include The Mall of America in Minneapolis and Las Vegas, both one-industry complexes that revolve around entertainment. Dining establishments such as Planet Hollywood, Hard Rock Café and House of Blues are all thematically-oriented as well.
motivate change in their audience. Lack of persuasive intent on the part of producers does not necessarily, however, translate into nontrivial effects. For example, some of the earliest media effects research explored the association between exposure to violent programming and aggressive behavior among young viewers (Bandura, Ross & Ross, 1961). More recently, scholars have extended exploration of media’s influence to a variety of outcomes including childhood obesity (Redelmeier and Stanbrook, 2003), sexual risk and responsibility (Escobar-Chaves et al., 2005), creation and maintenance of ethnic stereotypes (Oliver, 2006) and smoking initiation and cessation (Wakefield et al., 2003).

In contrast, entertainment media can be used in deliberate fashion. For centuries, means of entertainment (e.g. story-telling, drama and dance) have offered instruction while simultaneously providing a forum for social interaction and reflection. More recently, the practice of intentionally positioning educational content within an entertainment context has been recognized as a veritable strategy for advancing public health goals and is referred to as entertainment-education. Increasingly, carefully-crafted messages are appearing in popular music (Church & Geller, 1989; Kincaid et al., 1998), television (Collins, Elliott, Berry, Kanouse & Hunter, 2003), comic books (Milleliri, Krentel & Rey, 2003; Schinke, Gordon & Weston, 1990) and video games (Brown, Lieberman, Gemeny, Fan, Wilson & Pasta, 1997; Dragone, Bush, Jones, Bearison & Kamani, 2002).
Much of the research that has informed and guided our way of thinking about entertainment education developed prior to the advent of many communication technologies (e.g. internet, interactive gaming) and in parts of the world very different from the media landscape here in the United States. The existing US system of commercial broadcasting and government intervention limits projects that involve the development of programming that places continuous emphasis on select issues. Rather, the U.S. approach to entertainment education has predominantly focused on integrating messages into ongoing storylines in broadcast media. As such, efforts in the United States rely primarily on outreach to major television networks to offer expert information and resources to be used in single episodes (Montgomery, 1989).

As has been previously discussed, people make inferences and draw conclusions from entertainment media, even when its content is produced with the exclusive intent to entertain an audience. Rather than differentiating between programming produced with or without persuasive intent, this research program emphasizes the fact that much of today’s entertainment programming is presented in narrative form.

**B.2) Narrative as a persuasive tool**

Recently, Kreuter, Green, Cappella and colleagues (2007) put forward four distinct capabilities of narrative. These include its faculty in (a) facilitating information processing; (b) overcoming audience resistance; (c) providing surrogate social connections and (d) addressing emotional and existential issues. In this section, I will
address these factors and show how each contributes to narrative’s ability as a persuasive tool.

**B.2a) Facilitating information processing**

A sizeable body of literature, across content domains (e.g. public health, politics) and different contexts (e.g. news programming versus fictional drama) has shown that narrative has the potential to facilitate attention, comprehension, and recall of embedded messages. This is especially true when intended recipients have limited ability or motivation to process a more didactic message (Kreuter et al., 2007). Studies show that recall of narrative information is twice as likely as recall of expository information (Graesser, Hoffman & Clark, 1980; Haberlandt & Graesser, 1985). According to Schank & Abelson (1977, 1995) and Graesser and Ottati (1995), narrative information may be privileged by its skeletal features or schema-like patterns. Schemas, from a theoretical perspective, offer a way of thinking about how viewers can construct meaning from a narrative program.

Schemas can be thought of as templates for enabling individuals to store perceptual and conceptual information about their surroundings and allowing them to make interpretations of events through experience. The concept, "schema," has been referred to in a variety of ways, including "cultural model" (D'Andrade and Strauss, 1992; Holland and Quinn, 1987), "mental model" (Johnson-Laird, 1983), "idealized cognitive model" (Lakoff, 1987), "folk model" (D'Andrade, 1987), "script" (Schank and Abelson, 1977), "scene" (Fillmore, 1975), and "frame" (Minsky, 1975). Notably, there
are characteristics that distinguish these conceptualizations from one another. For example, as Busselle & Bilandzic (2008) point out, schemas exist independent of the narrative while mental models are “cognitive representations of events and states of affairs constrained in the time and space of the narrative.” It is the process, then, of relying on pre-existing schema to create mental models that guides a viewer through the narrative experience.

**B.2b) Overcoming audience resistance**

“Narrative forms of communication might enjoy some special advantage over more didactic forms for addressing particular bases of resistance,” (Kreuter et al., 2007, 223). Resistance can be broadly defined as one’s reaction against change, or motivation to counteract a persuasive appeal (Knowles & Linn, 2004). Kreuter and his colleagues (2007) distinguish between an individual’s resistance to a behavior and his/her resistance to a persuasive message, both of which can be advantageously addressed through narrative communication. Resistance to a behavior, for example, might involve denying the effectiveness of a behavior (e.g. mammography as a preventive measure against breast cancer) or simply choosing not to perform a particular action (e.g. breast self-examination). Depending on the class of behaviors under consideration, resistance of this sort frequently originates with an individual’s perceived lack of self-efficacy. Through modeling, viewers can watch similar others succeed and gain an understanding of what to expect (e.g. Anderson, 2000).
A second basis for resistance to behavior involves response efficacy. That is, an individual may not believe that a particular action can actually have an effect. Although little is known about the persuasive power of narrative versus expository information in terms of addressing behavioral barriers, it is reasonable to assume that a compelling narrative may convey the benefits of performing a behavior more effectively than a recitation of statistical data (Green & Brock, 2000). The personal accounts, especially from similar others, stands to be a powerful means of persuasion (Brosius, 1995; Brosius, 1996, Zillman & Brosius, 2000).

When exposed to overtly persuasive communication individuals can engage in a variety of ways that lead to resistance of message acceptance. Narrative communication, on the other hand, can activate different processing strategies that often preclude cognitive resistance and minimize the likelihood of counterarguing. For example, suspension of disbelief and intense absorption produced through engagement with the story, termed transportation, can depress one’s ability to generate counterarguments. In fact, Slater (1997) argues, narrative transportation and counterarguing are “fundamentally incompatible.”

More often than not, narratives involve exemplars, defined as “personal descriptions by people who are concerned or interested in an issue” (Brosius, 1999, p. 179). The very nature of exemplification (of a health concern, political orientation etc.) makes it difficult for people to discount narrative content. While this can be advantageous in certain situations, there remains the possibility that individuals may
generalize from exemplar accounts and expand the exemplar account as being a typical representation of those affected by a problem (Hamill, Wilson & Nisbett, 1980) or overestimating the prevalence of an issue (Zillmann, Perkins & Sundar, 1992). Celebrity announcements or endorsements illustrate the power of narrative to generate awareness and, in many cases, behavior change. The “Couric Effect”, for example, refers to the 20% increase in colonoscopies performed in the months following a televised broadcast of Katie Couric getting the screening for herself (Cram et al., 2003). Audience response to celebrity news stories (e.g. Magic Johnson’s disclosure of his HIV+ status, Nancy and Ronald Regan’s respective breast and colon cancer prevention campaigns) may be a result of identification. Identification, described below, encourages attention to the message, thoughts about the message post-viewing and interpersonal discussion (Rubin & Perse, 1987).

Insofar as narratives employ a relatively subtle form of persuasion, they lower one’s guard to the possibility of overt persuasion. This may increase receptivity to a message that otherwise would have been discredited, or even avoided altogether (Dal Cin, Zanna & Fong, 2004).

**B.2c) Providing surrogate social connections**

One way narrative provides viewers with surrogate social connections is through parasocial interaction (PSI). Parasocial interaction is thought to result from viewer interaction with media figures (i.e. hosts, actors, celebrities) and involves the formation of parasocial relationships to which viewers may respond as if they were typical social
relationships (Horton & Wohl, 1956; Giles, 2002). Research suggests that, once established, media figures can often be looked to for counsel and comfort as viewers appreciate their values and motives (Papa, Singhal, Law, Pant, Sood, Rogers & Shefner-Rogers, 2000). Viewers of the E-E film, Yellow Card, for example, addressed thousands of emails to the characters themselves, often filled with phrases such as “I love you” or “I think you’re great” or requests for personal contact, “I really want to be friends, please write me” (Buenting, 2003).

In a distinct departure from other conceptualizations of narrative engagement, the type of involvement brought about by PSI may induce central processing of a message (Slater & Rouner, 2002). Central, or active, processing of a message has been shown to improve retention (Larsen, 1991) and is thought to be associated with attitude and behavior change from audiences “having internalized the values and experiences embodied in the story, rather than through a direct acceptance of arguments presented,” (Slater & Rouner, 2002, p. 188; Parrott, 1995). ²

Despite the long-time concern over the influence of media figures in adolescence, most studies that consider the impact of role models on youth (e.g. thin models on adolescent eating habits; Harrison, 1997; Heilman, 1998) rely on identification as the central psychological process involved. Although this research program does not involve extensive testing of the PSI construct, it should be noted that

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² Parasocial interaction, then, is an alternative mechanism through which narrative can work to educate and/or persuade.
parasocial interaction as an explanatory mechanism for the persuasive effect of media is a “seriously neglected” topic in communication literature and by developmental psychologists (Giles, 2002).

**B.2d) Addressing emotional and existential issues**

Narratives and their exemplars, often foster identification and empathy. At its most basic level, identification involves shared perspective (e.g. age, gender, social class) between message recipients and key characters portrayed in a narrative (Feilitzen & Linne, 1975). An alternate form of identification, wishful identification, involves the desire to emulate the figure with which one identifies (Liebes & Katz, 1990; Zillman, 1994). Both of these media-user relationships differ, albeit subtly, from parasocial interaction. Most individuals begin to adopt PSI characteristics by early adolescence, a shift that is perhaps best illustrated in a set of studies that explored character preferences among a sample of children, ages 5 to 11, at various developmental stages. The qualitative data, collected by Giles and Long (1998), indicates that young children, particularly boys, rely on sex-role stereotyping (i.e. gender identification) when selecting favorite media characters. Five- and six-year old male study participants overwhelmingly preferred male characters to female characters. On the other hand, the selection of favorites by 10- and 11-year old participants reflects the influence of PSI, as many described them as sharing qualities of their friends.

Identification is also distinct from parasocial interaction in that it requires recognition of some salient characteristic, shared by both the viewer and the media.
Parasocial interaction can occur without shared perspective, thus explaining why one might engage with a character whom he/she actively dislikes (Giles, 2002).

An alternative way to think about identification comes from Cohen (2001). Cohen’s (2001) “point-of-view” interpretation defines identification as “a process that consists of increasing loss of self-awareness and its temporary replacement with heightened emotional and cognitive connections with a character,” (251). Cohen emphasizes, then, identification as a phenomenological process rather than an attitude, perception or emotion (Busselle & Bilandzic, 2008). Approaching the study of identification from this perspective, identification as metaphor rather than simile (e.g. “the [viewer] is the character for the duration of the story instead of recognizing similarities between him/herself and the character,” Busselle & Bilandzic, 2008; Kuiken, Miall & Sikora, 2004; Kuiken, Phillips et al., 2004), influences how one proposes mediated messages are processed. For example, PSI involves a more active role in processing of messages whereas identification draws a viewer into the story such that he/she can no longer engage in central processing.

**B.3) Theoretical Framework: How entertainment media can inform, persuade & motivate change**

Several theoretical paradigms are useful in guiding the present research. Developed independent of any consideration involving the role and function of media, psycho-social theories focus on individual-level cognitive and behavior change. While these theories offer limited utility in addressing complex individual and system
interactions associated with issues of media saturation, they are valuable in understanding micro-level learning processes. Particularly relevant to the study of fictional narrative, Bandura’s Social Cognitive Theory (1986) posits that individuals observe the behavior of role models they admire, leading them to make inferences and attributions about consequences of behavior, and acquire social scripts and normative beliefs that subsequently direct decisions about behavior. Thus, media constitutes a possible conduit for behavior modeling, as the constant stream of characters and portrayals present viewers with an opportunity to consider the acceptability of, and outcomes associated with, a particular behavior.

Separate corpuses of theories emphasize the roles and effects of media and society. There are strong theoretical reasons to believe that media plays an important role in socialization including the realism and consistency of content and limited access to countervailing information (Huston et al., 1998). A predominant theoretical model supporting this line of research has been cultivation theory which hypothesizes that invariant cultural patterns in media programming cultivate long-term beliefs about the real world (Gerbner et al., 1978). Essentially, cultivation theory assumes that media’s influence is indirect, subtle and cumulative. Bryant and Rockwell (1994) refer to this as “stalagmite effects – cognitive deposits built up almost imperceptibly from the drip-drip-drip of television’s electronic limewater,” (183). Greenberg (1988), alternatively, suggests more of a drench hypothesis whereby media portrayals with which viewers connect and identify exert the most influence. Although these perspectives propose
two distinct routes of media influence, one immediate and one more gradual, both assume identical end states. That is, media content can influence audiences.

Finally, consideration of select persuasion theories, such as Petty & Cacioppo’s (1986) Elaboration Likelihood Model (ELM), are appropriate in that they provide frameworks with which to conceptualize how narrative influence may come about. The traditional ELM model proposes that, together, an individual’s motivation and ability moderate central (i.e. attention to argument quality) versus peripheral (i.e. attention to source cues, argument quantity) processing. While such propositions are robust within the realm of overtly persuasive messages, researchers have voiced concern over the extent to which ELM processing holds up under conditions when the message is not perceived to have high issue or value relevance to the recipient (Slater, 2002). As one might imagine, these circumstances are especially relevant to the study of fictional programming. The care with which one weighs the pros and cons of a given message is arguably greater when the intent to persuade is high and there is a clear implication for one’s health, safety or quality of life, for example. On the other hand, individuals who encounter a message without any intent of being persuaded, as is the case with most entertainment television viewing, are less likely to engage their cognitive resources in much the same way.

**B.4) Narrative engagement as a mechanism of entertainment media effects**

Within both narrative and media effects literature there is a general lack of attention afforded to the process through which narrative might influence audiences.
The importance of narrative engagement as a concept in persuasion research is undisputed. Used somewhat inconsistently, engagement has emerged as a crucial contingency variable in persuasion and message effects research. It is useful in that it explains variation in how we process messages (Grunig, 1989; Petty & Cacioppo, 1986).

In a review of its usage over time, Slater (1997) notes that early conceptualizations framed involvement as a state of arousal/increased attentional capacity (Greenwald & Leavitt, 1984). Later approaches defined involvement motivationally (Mitchell, 1979; Park and Mittal, 1985). More recent frameworks present involvement-as-arousal while simultaneously recognizing the role of motivational antecedents which affect processing strategies (Andrews, Durvasala & Akhter, 1990; Johnson & Eagly, 1989).

Salmon (1986) concedes “[narrative engagement] has become a vague metaconcept that subsumes a class of related concepts that have both affective and cognitive derivations,” (p. 244). This lack of concept explication makes it difficult to successfully characterize one’s narrative experience. Alternative ways of interpreting viewer engagement measures can impact proposed models of narrative processing (Busselle & Bilandzic, 2008).

One of the most widely recognized conceptualizations of engagement with narrative is transportation, a distinct mental process involving “an integrative melding of attention, imagery and feelings” (Green & Brock, 2000, 701). Transportation was originally conceived and operationalized for use with print narratives. Although its
developers contend “the key psychological ingredients of the transportation experience are assumed to take place regardless of modality of communication,” there are potentially significant differences among media (Green, Brock & Kaufman, 2004, 312).

The formal properties associated with audio-visual material (i.e. its attention capturing and maintenance abilities), for example, can increase the likelihood of narrative immersion. Furthermore, television’s dual modality presents unique issues concerning how viewers respond to information presented in audio and video channels, both independently and in combination with one another (see Section E.2).

Only a few studies have looked at the role of transportation in an audio-visual environment (Dal Cin, Zanna & Fong, 2004; Rowe Stitt & Nabi, 2005; Slater, Rouner & Long, 2006). In their study of fictional television dramas, Slater and colleagues (2006) adapt Green & Brock’s (2000) transportation scale and found that their measures made up more than one dimension of television viewing. In addition to the transportation construct, several items overlapped with concepts such as perceived realism and identification. Such findings highlight the necessity for more detailed work investigating how transportation cultivates media effects.

Transportation emphasizes viewers’ perceptions of their experience with content, “rather than their judgments about the content itself, and encompasses their sense of a loss of self-awareness and sense of engagement with the story...transportation implies processing that is intense and uncritical,” (Bilandzic & Buselle, 2007). In other words, as viewers become increasingly absorbed in a story,
mental capabilities are allocated to processing the narrative rather than critically assessing content or challenging the story’s premise. Thus, it is this reduction in counterarguing that positions transportation as a mechanism for explaining the ability of narrative to influence attitudes and beliefs.

Unfortunately, although transportation is instructive in its utility to broadly capture a viewer’s experience with content, it does not allow for nuanced consideration of how the viewer reaches such a level of engagement. In all likelihood transportation is the result of several related, but unique, phenomena. Concepts such as identification and empathy, as well as narrative realism, are currently presented in the literature as necessary, though incomplete, predictors of transportation (Green & Brock, 2002). I argue that the current conceptualization of transportation is insufficient in partitioning out the distinct cognitive and emotional manifestations of the narrative viewing experience. To use a “toolbox” metaphor, offered by Nisbett and colleagues (2001) in their study of analytic versus holistic thinking: viewers of fictional programming are equipped with a collection of tools that can aid them in reaching a state of narrative engagement (transportation) but a particular tool may be more or less accessible in a particular situation.

This dissertation investigates the distinct cognitive and emotional dimensions that comprise one’s narrative engagement and comprehension through the development and validation of a process model. During Phase I propositions of the model are reviewed and a pilot study, designed to provide early validation of the model.
is conducted. Phase II seeks further validation of the model, applying alternative methodology to investigate the conditional nature of narrative engagement. The third and final phase considers the differential effects of narrative engagement on (a) information processing, (b) knowledge acquisition and (c) persuasion. Essentially, this final phase serves as a means of establishing the utility of narrative engagement in the broader scope of message design and evaluation.
III. Phase I: Model Development

Drawing from Csikszentmihalyi’s Flow Theory, a model of narrative processing is proposed; its basic assumptions are reviewed here.

C.1) Flow Theory

Originally advanced in the 1970s as a result of efforts to account for the pleasure found in everyday activities, Csikszentmihalyi’s (1988, 1997) concept of flow offers conceptual guidance in thinking about narrative engagement. Through watching artists and musicians at work, Csikszentmihalyi (1993) noticed that they became lost in the creative process – focused on their tasks yet removed from the world around them. The concept of flow, then, describes the phenomenological state that occurs when an activity provides an optimal level of challenge for one’s skill set, therein prompting an individual with the intrinsic motivation to continually strive toward just-manageable levels of challenge. It is characterized by focused concentration, loss of self-consciousness, a sense that one is in control of the situation and distortion of temporal experience.

In recent years, communication scholars have expressed interest in re-conceptualizing flow for application in media research (e.g. Finneran and Zhang, 2003; Mandryk, Inkpen, & Calvert, 2006; Sherry, 2004). The concept’s application has been particularly popular within video and online gaming contexts (e.g. Bryce and Rutter, 2001; Bowman & Sherry, 2006). Weber and colleagues (2009) caution, however, that video games may present a unique opportunity to elicit the balance of challenge and skill
necessary to create and maintain flow experiences. Media that do not involve active attention and effort on the part of the consumer would fail to meet the antecedent condition of challenging the user/audience’s skill set. To the contrary, Sherry (2004) argues, “Sometimes skill simply consists of specialized knowledge that is required for entrée into the genre,” (p. 335). He discusses the evolution of media and presents examples of film and television programs that have departed from standard conventions of shot composition, editing, use of sound and narrative structure. As media evolve, so do the requirements placed on consumers.

Perhaps as a result of the inherent difficulties in measuring a phenomenological state of being, attempts to re-conceptualize and operationalize flow within a media context are varied and inconsistent (see Weber et al., 2009, for a review). Most recently, Weber et al. (2009) propose a model of flow and cognitive synchronization, pointing out that their neurophysiological perspective allows for a method of dynamic real-time measurement. The authors point to limited empirical evidence based on a study using functional Magnetic Resonance Imaging (fMRI) and distraction during video game play. Although this was more an exploration of attentional networks than of flow experiences, patterns in the findings are promising.

**C.2) Model of Narrative Flow**

The model of narrative flow proposed here is based on basic tenets of Csikszentimihalyi’s Flow Theory as well as key concepts within the narrative domain. According to the model (see Figure 1), there are four unique dimensions in narrative
processing: Focus, Cognitive Arousal, Affective Arousal and Absorption. For conceptual purposes, the Affective Arousal dimension can be further segmented into: Sympathetic Arousal and Empathetic Arousal (i.e. Loss of Self-Consciousness).

Figure 1. Flow Model: Narrative engagement and story-consistent change

Arguably, narrative engagement begins when an individual’s focus is directed toward a story’s characters, situations and events (Slater & Rouner, 2002).³ Csikszentmihalyi (1978) notes:

“What to pay attention to, how intensely and for how long, are choices that will determine the content of consciousness, and therefore the experiential information available...Thus Williams James was right in claiming, ‘My experience is what I agree to attend to. Only those items which I notice shape my mind’” (p. 339).

³ While it is certainly possible that effects are observed based merely on exposure to media (e.g. Drew & Weaver, 1990), the current research emphasizes a viewer’s engagement with media.
By definition, the phenomenology of flow reflects attentional processes. An individual’s attention provides evidence that s/he has selectively invested in the present exchange.⁴

As viewers focus on the situation and characters presented within a narrative, pre-existing schemas are activated which allow viewers to create mental models. Defined as “cognitive representations of events and states of affairs constrained in the time and space of the narrative” (Busselle & Bilandzic, 2008), these models facilitate comprehension. The construction of mental models, indeed, invites cognitive elaboration and affective response from viewers. Therefore:

Proposition I: Focus is a necessary pre-condition to subsequent sub-processes of narrative flow, namely Cognitive and Affective Arousal.

Arousal refers to a period of heightened physiological and/or psychological stimulation. This dimension corresponds to Csikszentmihalyi’s concept of awareness. Awareness, according to Csikszentmihalyi (1978), involves the system “encompassing all of the process that take place in consciousness, such as thinking, willing and feeling about information” (p. 91).

Arousal can be comprised of both cognitive and affective factors, although it is unclear whether one necessarily precedes the other (Busselle & Greenberg, 2000). One proposition is that cognitive processes, relating to viewer perceptions of realism, are

⁴ As it is presently conceptualized, Focus can be compromised by any number of pre- or coexisting distractions. For example, an individual may struggle to attend to a narrative because s/he has an interview the next day or just received startling news. Similarly, an individual may be distracted while viewing a narrative if there are several people in the room, if there is a knock on the door or if s/he receives a phone call.
“central” to any of the other dimensions of narrative engagement (Busselle & Bilandzic, 2008, p. 14). Therefore, the following research question is put forward:

RQ1: What is the relationship between Cognitive Arousal and Affective Arousal?

First, factors that influence cognitive arousal are considered. Narrative processing can be significantly impacted by the extent to which material is perceived as realistic (Perse, 1986; Potter, 1986). Both external realism, the degree to which fictional content is consistent with the real world (e.g. clothing, physical settings, dialogue and situations) and narrative realism, the degree to which there is consistency among logic, motivation and events within a fictional context, contribute to one’s judgments.

Importantly, the social cognition literature distinguishes between memory-based, or reflective, realism judgments and online judgments of realism (see Hastie & Park, 1986). Memory-based realism judgments occur retrospectively and are informed by memory content previously processed and stored (Hastie & Park, 1986). In contrast, online realism judgments occur during viewing (Shapiro & Chock, 2003; Shapiro & Lang, 1991), most likely as the viewer retrieves schema and constructs the mental models necessary to understand the narrative.

For the most part, consumers of fiction are able to “suspend their disbelief” (Worth, 2004), thereby granting these types of narratives a higher threshold of realism than, for example, a news story. As long as a program is “internally coherent...doesn’t contradict itself...and leaves nothing jarringly unexplained”, (Hall, 2003), viewers have little motivation to critically evaluate content while viewing. On the occasion when
story events or character behaviors do not otherwise make sense, audience members are forced to think critically, incorporating new information into their mental models.

Experimental research using text-based narratives provides additional evidence that story inconsistencies interfere with engagement (Albrect & O’Brien, 1993; Kaup & Foss, 2005; Rapp & Gerrig, 2002). For example, the average length of time it took individuals to read a story increased when characters’ traits and behaviors were inconsistent with one another (e.g. vegetarian eats a cheeseburger, Albrect & O’Brien, 1993). Within an audio-visual context, individuals do not have the option of “slowing down” the process. Rather, negative cognitions associated with violations of realism disrupt cognitive arousal and lower transportation (Busselle & Bilandzic, 2008; Green, 2004). Prentice and Gerrig (1999) echo that doubt, prompted by “obvious cues,” can lead a viewer to question the narrative and retreat from the ‘story world’ (p. 531).

Conversely, a healthy (i.e. uninterrupted) dose of cognitive arousal is proposed as a necessary pre-condition for the heightened cognitive connections and coherent story processing that characterize the final dimension of narrative engagement, Absorption.

Proposition II: Cognitive Arousal is a necessary pre-condition to Absorption.

Having considered factors that influence cognitive arousal, the discussion would be remiss without mentioning affective features of arousal. Narratives and their characters often foster identification and empathy (refer to Section B.2d). Viewers often identify characteristics or traits they themselves share with characters. This provides viewers an opportunity to understand (i.e. sympathize with) characters’
situations, behaviors and emotions. At the same time, it is also possible that a character’s words and/or actions trigger negative reactions, engaging viewers in a form of negative affective arousal. It is proposed that the processes occurring during the Affective Arousal dimension serve as a springboard for more intense involvement with the story and its characters.

Proposition III: Affective Arousal is a necessary pre-condition for the final dimension of narrative flow, Absorption.

Cohen’s (2001) “point-of-view” interpretation of identification positions it as “a process that consists of increasing loss of self-awareness” (p. 251). This actually does a nice job of characterizing the shift that occurs as individuals move from Affective Arousal to the final dimension represented in the model, Absorption. In order for an individual to be considered “in flow” s/he cannot be engaged in any conscious cognitive or affective activity (Nakamura & Csikszentmihalyi, 2005). This includes self-reflection and/or comparison. Any sort of identification processes would necessarily shift away from inducing a sympathetic relationship (feeling for) to an empathetic one (feeling with). In addition to loss of self-consciousness, absorption is further characterized by temporal distortion.

C.3) Model Development (Pilot Study I)

The narrative processing model proposed here assumes that there are a variety of unique, yet related, factors that work together to produce flow. It goes so far as to

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5 Thus reinforcing the afore-mentioned argument that parasocial-interaction is a unique mechanism not to be considered an intervening variable in transportation.
suggest that the relationship among these factors is hierarchical. In order to explore the nature of and relationships between the sub-processes proposed in the model a pilot study was conducted.

Traditionally, research on narrative transportation is collected following exposure to a stimulus program. Aside from problems associated with retrospective measures (e.g. recall bias, mental editing), this practice provides little insight into the ongoing process. Continuous response measurement (CRM) is a data collection technique well-suited to exploring theoretical issues regarding cognitive processes associated with continuous messages. CRM systems are designed to log moment-by-moment shifts in self-reported mental states, evaluations and/or opinions during message processing. From Merton et al.’s (1956) seminal focus group work on viewers’ thoughts during media viewing, to its utility in the political arena, measuring voter opinions of political candidates and debates (e.g. West, Biocca & David, 1991, 1992), to its extensive commercial applications (e.g. Hughes, 1992; Zabor, Biocca & Wren, 1991), CRM technology has been applied in a variety of contexts. To date, however, there is no research that utilizes continuous response measurement to investigate the psychological processes involved in narrative communication.

Whereas the model proposes that its four unique dimensions are necessary to produce narrative flow, it does not propose that it is sufficient in characterizing the narrative experience. That is, the model does not address various features of the narrative, the individual or the environment that influence engagement.
Communication is a dynamic process, and narrative communication is no different. Characters and events are introduced and develop at varying rates; in the context of entertainment media, multiple storylines are often embedded within one larger narrative. As scenes/stories switch, it is not unreasonable to assume that viewers’ cognitive states change continuously, resulting in varying levels of engagement as their attendance to, comprehension of and response to messages changes. The processes underlying such shifts are unclear. This exploratory study considers viewers’ engagement with a story and its characters over time. It also solicits audience feedback about their “on-line” thoughts during viewing.

**RQ:** What psychological processes underly shifts (i.e. increases or decreases) in viewer engagement over the course of stimulus viewing?

**Methods**

**Sample Characteristics**

Participants from a large, northeastern city were recruited through an online posting on Craig’s List in exchange for a small cash payment.

The final sample consisted of 29 participants (62.1% male). Nearly two-thirds of participants (65.5%) were between the ages of 18 and 35 years and the majority (75.8%) held a college degree. Fifty-five percent of the sample identified as Caucasian, 34.5% identified as Black, 6.9% as other/multi-racial and 3.4% as Asian. Sixty two percent of participants reported a combined annual household income of less than $50,000. Fifteen percent of the participants reported a combined annual household income of
more than $100,000.

**Stimuli and Apparatus**

Three stimuli from an episode of the medical drama *ER* were screened; descriptions of each are available in Appendix A. Total viewing time for each clip was between 10-13 minutes.

This program reflects the recent popularity in medical-based drama (e.g. Grey’s Anatomy, Private Practice). The program, *ER*, contains intense and emotional material, providing subjects with a variety of content with which to engage, as well as a diverse cast, providing audience members numerous characters with which to identify.

The video stimuli were viewed by participants in the Media Lab in the Annenberg School for Communication at University of Pennsylvania. The display systems used for presentation of stimulus material were large flat panel color monitors (23”). In an effort to maintain ecological validity, the size and resolution of these monitors closely resemble the media systems with which a typical viewer might interact.

Continuous response measurement was implemented using an online-rating function of MediaLab software (Jarvis, 2004). During the stimulus presentation, a 9-point rating scale was displayed at the bottom of the monitor screen such that the video clip occupied almost the full screen. Participants used the left and right arrow keys on the keyboard to move a pointer along the on-screen rating scale.
Design & Procedure

This was a within/between-subjects design with two experimental factors: Transportation (high versus low) and Narrative Content (HPV, BRCA1, Obesity).

Participation involved watching three stimuli. In order to prevent fatigue effects, subjects were randomly assigned to one of three conditions varying the order of Narrative Content (ABC, BCA, CAB where A=BRCA1, B=HPV and C=Obesity).

Transportation was randomized within each sequence such that each participant received at least one High and one Low stimulus.

Participants arrived at the Media Lab and were seated at an individual viewing station. After reading an informed consent form, participants were provided with instructions on how to provide continuous response data throughout each program. Specifically, participants were given the following instructions both verbally and on screen:

“I would like you to indicate how engaging the events and people in the show are by pressing the right and left arrow keys on your keyboard (visual included). By engaging, I mean that the events and people invite you to become mentally and emotionally absorbed in the story. If you think the events and people are engaging, press the key with the right arrow. The more engaging you think they are, the more often you should press the key with the right arrow. If you think the events and people are not engaging, press the key with the left arrow. The more disengaging you think they are, the more often you should press the key with the left arrow. Please keep pressing the appropriate keys to indicate your rating throughout the segment as things change.”

Participants were given an opportunity to run through a 60-second practice trial. Immediately following each ER segment, subjects answered questions about their level
of engagement. Also following each segment were items assessing the personal relevance of the narrative content and subjects’ familiarity with the program/episode prior to that day’s viewing. Participants also completed a personal questionnaire consisting of demographic items and several questions about media habits.

The study concluded with a stimulated recall interview. During these interviews, study participants provided feedback about their thought process during “key” moments – those in which there was a visible shift in engagement levels. Before beginning the interviews, the researcher was able to review CRM data as it was recorded. This permitted the researcher to select one of the three stimuli, the one that produced the most variability in engagement ratings, to serve as the focus of the recall interview.

Before re-viewing any portion of the selected stimulus, participants were encouraged to reflect upon and discuss various aspects of the program. Then, as particular moments from the program were shown on screen, participants were asked questions (e.g. "Can you describe what was going through your mind at this point during program?") designed to stimulate reflection about their views, feelings and considerations during key moments (i.e. dips or spikes in involvement). Following the stimulated recall interview, participants were debriefed.

*Measures*
Continuous Response Data: Consistent with methods used by Shapiro & Chock (2003), online ratings were sampled once every 1/10 second. For each 1 second segment, the average rating was computed.

Transportation: Green & Brock’s (2000) 11-item Transportation Scale was used (α=.69 to .92). Items were modified to accommodate an audio-visual narrative since items were originally developed for text. Items were measured on a seven-point scale ranging from 1(strongly disagree) to 7 (strongly agree). Examples of items include “The story was so clear to me that I knew its smell, touch, and "feel" and “I had trouble visualizing the persons and places described in the story.”

Personal Experience and Program-Related Outcomes: Participants were asked to indicate their personal experience with various types of cancer and cancer-related outcomes (e.g. “A family member or someone close to me has been diagnosed with cervical cancer”; “I work on these issues through my job or volunteer work.”) Participants were also asked to indicate whether they had seen any of the stimuli prior to the study and, if so, how long ago.

Media Use: Participants filled in, in hours and minutes, frequency of television exposure on both a typical weekday (e.g. Tuesday, Wednesday) and a typical weekend (e.g. Saturday, Sunday). Participants were also asked about the regularity with which they watch a select list of television programs, specifically ER, House, Private Practice, Grey’s Anatomy and Scrubs.
**Participant Demographic Information:** Key descriptive and sociodemographic information on each participant was collected.

*Data Analysis (Overview; results follow below)*

**Stimulated Recall Interview**

Data analysis began with a review of transcripts from the stimulated recall interviews. The objective of this review was to determine whether viewers’ shifts in engagement could be attributed to the sub-processes proposed in the model of narrative flow. During the review, viewers’ self-reported reasons for increases and decreases in engagement were extracted. In order to avoid biased interpretation of important conceptual and contextual differences among the reasons provided, a two-step evaluation strategy was developed.

Six independent evaluators were asked to sort all of the reasons associated with increases and decreases in viewer engagement into piles based on the degree of similarity among them. Evaluators were told that most people used 3-4 piles, but they were instructed to use as many piles as they found necessary to create natural groups that captured the similarities and differences they perceived among the reasons. The average number of piles was four. Inter-evaluator reliability (Cohen’s Kappa) was then calculated using PRAM software, comparing each evaluators’ sorting decisions against both the researchers’ decisions and against all other evaluators.
While the sorting activity is designed to provide evidence for “piles” that represent sub-processes set forth in the proposed model, the second rating phase is used to establish whether these sub-processes are sufficiently characterized by the model. Upon completion of the sorting activity, evaluators were provided with a set of possible labels that may/may not be suitable for describing the piles they created. These labels were based on the model and described reasons for variation in viewer engagement (i.e. “lack of realism,” “identification with character”). Ten labels offered possible ways of describing piles created with reasons for increased engagement and eight labels were proposed for piles using reasons for decreased engagement.

Evaluators were asked to rate how well, on a 7-point scale, each label captured the perceived similarities among reasons within each pile. Insofar as each label was rated for each pile created, there are natural “foils” — labels that should not receive high ratings for particular piles because they are inappropriate representations.

Continuous Response Data

The next phase of data analysis involved consideration of the continuous response data. Having determined the ratings from individual participants to be reliable (with other participants’ ratings) the mean series was calculated across all participants assigned to a particular ER excerpt (n=14 or 15).

$$M = m_1 m_2 \ldots m_n$$

with

$$m = \frac{\sum_{j=1}^{n} y_j}{n}$$
where \( m_t \) represents the mean score of all subjects at time \( t \), \( y_{it} \) represents the score of subject \( i \) at time \( t \), and \( n \) represents the total number of subjects.

Following a visual inspection of the mean series, significant deviations were identified. These events were tied back with audience tellback, therein producing a richly detailed picture of the changes (and continuities) associated with narrative flow.

**Results**

Twenty-nine participants completed this study. Ten participants viewed stimuli in ABC order (BRCA1, HPV, Obesity), ten viewed stimuli in BCA order (HPV, Obesity, BRCA1) and the remainder (\( n=9 \)) viewed stimuli in CAB order (Obesity, BRCA1, HPV). Equal numbers of participants saw high and low (transportation) versions within each stimulus program.

*Evaluation of Stimulated Recall Interviews: Card Sorting and Rating Activity*

A total of 56 reasons associated with increases (\( n=24 \)) and decreases (\( n=32 \)) in engagement were extracted by the researcher. These reasons were sorted into piles according to perceived similarities and differences by six independent evaluators. First, sorting decisions related to decreases in viewer engagement were considered. As shown in Table 1 below, when comparing the researchers’ sorting decisions against each individual sorter, kappa ranged from .71 to 1 for the Focus category, from .92 to 1 for the Cognitive Arousal – Lack of Context category and from .74 to 1 for the Cognitive Arousal – Lack of Realism category. Average kappa scores across all sorters were also

\[ \text{7 There were no differences in transportation levels based on the order of stimuli.} \]
Reliability, across sorters (average kappa = .61) and between the researcher and each sorter independently (kappa ranged from .54 to .93), was less than desirable for the Affective Arousal – Inability to identify category.

| Table I. Inter-rater reliability of evaluations of viewers’ variation in engagement |
|---------------------------------------------|-----------------|-----------------|
| Reasons for variation                      | Researcher versus independent sorters | Average kappa (n=7) |
| Decreasing Engagement                      |                               |                   |
| 1. Focus                                    | High K = 1.0          | K = .82          |
|                                             | Low K = .71           |                   |
| 2. Cognitive Arousal (-)                    | High K = 1.0          | K = .83          |
| Lack of context                            | Low K = .6            |                   |
| 3. Cognitive Arousal (-)                    | High K = .1           | K = .91          |
| Lack of realism                            | Low K = .74 (1x)      |                   |
| 4. Affective Arousal (-)                    | High K = .93          | K = .61          |
| Inability to identify with character(s)    | Low K = .54           |                   |
| Increasing Engagement                      |                               |                   |
| 1. Focus                                    | High K = .51          | K = .48          |
|                                             | Low K = .3            |                   |
| 2. Cognitive Arousal (+)                    | High K = .9           | K = .65          |
| Story/Character assessment                  | Low K = .5            |                   |
| 3. Affective Arousal (+)                    | High K = .82          | K = .4           |
| Ability to identify with character(s)      | Low K = .2            |                   |

Note: There were two isolated instances in which one evaluator’s scores for a single category were dropped because they varied significantly from the other evaluators’ scores.

Next, sorting decisions related to *increases* in viewer engagement were considered. When comparing the researchers’ sorting decisions against each individual sorter, kappa ranged from .28 to .51 for the Focus category, from .5 to .9 for the Cognitive Arousal – Assessment category and .2 to .82 for the Affective Arousal – Ability category.

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For the Affective Arousal (-) Inability to identify category, the dropped evaluator’s sorting decisions were dissimilar to the other six evaluators. In this case, reliability increased from .46 to .61 with removal of evaluator 4. For the Cognitive Arousal (+) Story/Character assessment category, the dropped evaluator’s sorting decisions produced negative kappa scores with each of the other evaluators; here, reliability increased from .45 to .65 with the removal of evaluator 2.
to identify category. Average kappa scores across all sorters were consistently inconsistent as well (.48, .65 and .4, respectively).

In an effort to account for inconsistencies in sorting decisions, evaluators’ open-ended feedback about their decision-making, as well as their ratings of possible category (pile) labels, were consulted. It appears that evaluators’ decisions may simply represent a more refined version of the researcher’s sorting scheme. To this end, evaluator categories were combined where appropriate.

Once these “like” categories were combined, kappa scores improved substantially. The Affective Arousal – Inability to identify average kappa score increased from .47 to .72 and, comparing the researcher’s decisions against others’, kappa ranged from .83 to 1. Similarly, the average kappa score increased from .4 to .8 for the Affective Arousal – Ability to identify category. Kappas ranged from .7 to .91, comparing the researcher against other sorters.

9 Three of the labels provided to evaluators as possible reasons for decreasing engagement included: “Inability to identify with character(s) and/or storyline(s)”; “Character and/or storyline was boring”; “Personal dislike of actor/actress”. Arguably, these might be considered finer distinctions of the umbrella category, Affective Arousal – Inability to identify. Evaluators 2 and 3 created two piles whose highest rated labels (7s on a 7-point scale) were for labels “Character and/or storyline was boring” and “Personal dislike of actor/actress.” The evaluators’ self-created labels for these piles were “Boring,” “Disdain for a character,” “Not interested/invested in the characters (don’t care),” and “Annoyed/boring characters.” Similarly, three of the proposed labels for piles representing increasing engagement had to do with viewer-character relations: “Make sense of the characters and their situations”; “Identification with character(s) and their situations”; “Emotional response due to perceived similarity and/or sympathy for character(s)” and may represent the broader category, Affective Arousal – Ability to identify. Evaluators 3-6 had between two and four piles combined based on the fact that their highest rated labels (6.5 to 7 on a 7-point scale) corresponded with one of the above. Evaluators’ self-created labels for their piles were “Sympathy for the mother,” “Similar personal situations/character identification,” “Compassion/connection to mother,” “Relate because of personal experience,” and “Emotional,” “Ability to empathize with character” and “Moved despite lack of personal experience.”
The only remaining categories with less than desirable reliability are the Focus and Cognitive Arousal ones relating to increased levels of engagement. Here, it appears that the majority of sorters failed to make a distinction between increased levels of attention and increasing efforts to make sense of the characters and/or storylines. Indeed, if the researcher were to concede the division of reasons representing increased Focus (n=3) and combine them with those in the Cognitive Arousal category, the average kappa score would be .71.

Suitability ratings provided following the sorting activity were then further reviewed to determine how well various labels captured evaluators’ perceived similarities and differences among piles.  

The ratings from each of the six independent evaluators were averaged for each category (i.e. pile). Table 2 depicts the labels that were identified as the “best” descriptors for each pile. These labels align closely with the individual components of the proposed model of narrative flow, suggesting that it successfully captures the various psychological processes involved with one’s narrative experience. There were no instances where viewer tell-back regarding variation in engagement did not correspond with one of the model’s four unique dimensions. However, evidenced in the

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10 As was described above, there were several instances during the sorting analyses where evaluators’ piles were combined to create a single, more inclusive pile (e.g. disdain for character + bored with character = Affective Arousal – Inability to identify). To remain consistent, evaluators whose piles had been combined in the sorting analyses had their ratings for those piles combined (averaged). Likewise, ratings from evaluators who were dropped during the sorting analyses were excluded.
multiplicity of ways evaluators considered affective responses to the narrative, the model’s dimensions represent complex sub-processes of an even more complex experience, affected by individual characteristics, environmental factors and features of the narrative itself.

**Continuous Response: Trends in Viewer Engagement**

To reiterate, participants’ engagement ratings, ranging from 1 (completely disengaged) to 9 (completely engaged), were sampled once every 1/10 of a second. In
order to produce a more manageable and meaningful time unit data was collapsed into one-second intervals.

Before calculating the mean series for the sample as a whole, inter-rater (i.e. inter-participant) reliability was established. Each stimulus program’s 14 or 15 participants’ ratings were treated as a single scale and each individual participant’s rating was treated as though it were an item in the scale. Participants’ engagement levels were highly reliable across all six stimuli (.82 < α < .89).

Figures 2-4 illustrate engagement trends for the duration of each of six stimuli versions. A visual inspection of the mean series suggests a general upward trend in viewer engagement, with viewers becoming increasingly engaged as time elapses. In the BRCA1 and HPV conditions, this upward trend is particularly accentuated during the first two minutes of the program. Still, as evidenced by “peaks” and “valleys” at various points throughout the clips, it appears that viewers experience varying levels of mental engagement.

**Figure 2. Average Engagement Ratings over time for BRCA1 Condition**
and/or emotional involvement. Engagement, then, may not necessarily be an “end state” so much as a dynamic one.

Insofar as it is difficult to visually distinguish which “peaks” and “valleys” constitute a significant departure from the mean, Biocca, David and West (1994) recommend standardizing the mean series and identifying points whose Z scores fall outside of the 95% confidence interval. This particular method proved too sensitive.
Therefore, the criterion for identifying significant events was designated as +/- one standard deviation from the mean.

There were a total of 26 significant events across the six stimulus episodes; twelve of these were “low” events in which the average engagement rating fell one standard deviation below the mean and 18 were “high” events characterized by engagement levels at least one standard deviation above the mean (see Table 3). Each episode contained between three and six significant events (M=4.67).  

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean</th>
<th>SE</th>
<th>SD</th>
<th># of Significant “High” Events (+1 SD)</th>
<th># of Significant “Low” Events (-1 SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRCA1 Low</td>
<td>6.23</td>
<td>.02</td>
<td>.59</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>BRCA1 High</td>
<td>6.64</td>
<td>.03</td>
<td>.86</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>HPV Low</td>
<td>6.26</td>
<td>.03</td>
<td>.71</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>HPV High</td>
<td>6.23</td>
<td>.02</td>
<td>.68</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Obesity Low</td>
<td>5.84</td>
<td>.03</td>
<td>.67</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Obesity High</td>
<td>5.97</td>
<td>.03</td>
<td>.78</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>16</td>
<td>12</td>
</tr>
</tbody>
</table>

The significant moments of each ER segment were reviewed by the researcher and brief descriptions of each were compiled. The researcher then consulted the transcripts from the stimulated recall interviews and extracted participants’ comments that dealt with segments of the stimuli identified as significant events (see Appendix B).

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11 There exists a potential for serious distortions when relying solely on the mean series. Given that the mean may obscure individual shifts that may cancel each other out, two additional techniques were used to examine the data – an absolute activity score, or “slope of liking” and a mean activity series. The results suggested the mean series is a relatively accurate representation of the data.
When considering structural and content features of the narrative during significant events, as well as viewer tellback from these moments, several similarities are noted. Of the 12 significant “low” events, half occur during the first 1-2 minutes of programming. These early moments of the narrative are a period of adjustment; viewers are orienting themselves and making preliminary assessments of characters and storylines. The remaining six “low” events involve scenes that lack context (e.g. an unfamiliar character is introduced) and/or threaten viewer focus (e.g. conversations that are difficult to understand or described as “boring”). Taken together then, the twelve segments of significantly low engagement might all be described as periods during which comprehension is sacrificed as a result of undue cognitive demands placed on the viewer.

Segments that had significantly high engagement represent climactic points of several storylines contained within the stimuli. Viewer feedback suggests these moments are characterized by novelty. In one scene, for example, an adolescent girl is told the results of her pap smear have come back irregular. She is diagnosed with HPV. When advised that she inform her partner, the girl reveals that she has had many; she and her friends attend sex parties. Tellback reveals that viewers liked hearing about this “new disease” and that they were surprised to hear about youth participating in sex parties. “High” events were also characterized by tension (e.g. BRCA1 patient asks doctor which “poison” she should pick – a mastectomy or the chance of developing breast cancer). In contrast to non-significant or “low” events, then, high engagement
occurs synonymously with arousing content – that which energizes and excites the audience. Arousal can be both emotionally and mentally driven.

Limitations

There are several limitations worth noting. As with any convenience sample, there exists the possibility of selection bias. Although the initial solicitation did not specify the particular series (ER) being screened, it did label the study as “entertainment television research”; participants may have self-selected into the study due to a predilection toward entertainment programming. Although participants were asked about their prior exposure to the stimuli episodes, it is possible that heavy (i.e. frequent) viewing of the stimulus series was a potential confound. However, given the distribution of participants’ prior exposure, and information volunteered during the interviews, this seems unlikely.

This study relies on clips from a single network drama, ER. While this may limit heterogeneity among responses, the decision was made intentionally. Insofar as several other key variables (e.g. characters, production/editing techniques – use of music, # cuts and edits) were consistent between stimuli, this study explored, more pointedly, the effects of variation in topical content. Although we are better able to draw conclusions about the [in]consistency of processing patterns across multiple content areas within a single series, caution must be taken when interpreting results beyond ER. The findings presented here may generalize to other series within this genre, however replication

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efforts should ensue to verify this as well as to explore patterns in narrative processing across other genres.
IV. Phase II: Model validation using a scaling technique

An objective of this dissertation is to develop, and validate, a model that describes how individuals process narratives. Pilot Study I provides early validation of the sub-processes that impede or enhance one’s “flow” experience. An alternative way of investigating whether the proposed model is valid involves the use of a scaling technique. The pilot study described below explores the possibility that individuals process narrative communication in a step-wise fashion.\footnote{While the use of a self-report, post-exposure scale does not provide dynamic feedback on narrative flow per se, its Guttman-like composition works to capture viewers’ progression through the narrative.} It involves construction of a scale whose items were carefully developed and selected to reflect the dimensions of the proposed model – Focus, Cognitive Arousal, Affective Arousal and Absorption.

**D.1) Scale Development (Pilot Study II)**

*Hypotheses and Research Questions*

**H\textsubscript{1}**: Individuals scoring low on the Focus dimension, indicating low levels of attendance to the narrative, will score low on all subsequent dimensions, indicating minimal awareness of narrative content, low levels of cognitive and/or affective arousal and minimal absorption.

**RQ\textsubscript{1}**: Do individuals who score low on the Cognitive Arousal dimension necessarily score low on the Affective Arousal dimension?

**H\textsubscript{2}**: Individuals scoring low on the Cognitive Arousal dimension, perhaps indicative of negative realism judgments, will also score low on the subsequent
Absorption dimension, indicating that involvement was interrupted before they became fully transported.

**H₃:** Individuals scoring low on the Affective Arousal dimension will also score low on the subsequent Absorption dimension.

*Methods*

Potential scale items were generated to represent five dimensions of narrative engagement: Focus, Cognitive Arousal, Sympathetic Affect Arousal, Empathetic Affect Arousal and Absorption. A total of 13 items were created or adapted from existing instruments based on face validity; a description of these items, along with their original source, is available in Appendix C. Each item was designed to be rated on an ordinal scale (*strongly disagree, disagree, agree, strongly agree*). For analyses purposes, responses were dichotomized into two categories: agree/disagree.

*Sample Characteristics*

The final sample consisted of 94 participants (81.9% female). Participants were primarily between the ages of 18 and 25 years (46.2%) with a college degree (70%). Most of the sample identified as Caucasian (81.7%), 6.5% identified as Asian, 5.4% as Black and 5.4% as other/multi-racial. Reported annual household income is relatively evenly distributed across five categories, ranging from less than $25,000 to $100,000 or more.

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13 Here, Affective Arousal is separated into two distinct dimensions representing sympathetic arousal and empathetic arousal.
Participants were primarily recruited using convenience and snowball-sampling methods.

**Design & Procedure**

During April 2009, individuals were invited to complete an online survey about their reactions to a text-based narrative. Email invitations, including a hyperlink to the web-based survey, were sent to a convenience sample. Of the 382 solicitation emails sent, 94 (24.6%) were completed.

During the recruitment process, individuals were randomly assigned to one of two conditions - high vs low engaging narrative. Hyperlinks contained with the solicitation emails directed participants to one of two surveys; the first contained a narrative considered to be high in engagement and the second contained one considered to be low in engagement. While the content of the story was the same in both conditions, paragraphs were reordered in the “low” condition in order to interrupt a smooth, linear, chronological flow. In a study of advertising intrusiveness transportation ratings between conditions differed significantly ($F(1,44)=12.99, p<.001$; Wang & Calder, 2006).

Participants began by reading a fictional story, originally from the bestselling book, “Chicken Soup for the College Soul.” After reading the story, participants completed a questionnaire containing the items designed to measure engagement with the story and its characters. For the purposes of testing scale validity, participants also completed transportation and need for cognition scales. In addition, participants provided basic demographic information.
Measures

Narrative Engagement Processing Strategy: This contained a total of 13 items (please refer to Appendix C for a complete list). In order to allow for dichotimization, responses were measured using a 4-point ordinal format ranging from strongly disagree to strongly agree. For analyses, responses of strongly disagree and disagree were combined (0) and responses of strongly agree and agree were combined (1).

Transportation: An abbreviated version (6-items) of Green & Brock’s (2000) Transportation Scale was used (α= .82). Items were measured on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Examples of items include “The story was so clear to me that I knew its smell, touch, and "feel" and “I had trouble visualizing the persons and places described in the story.”

Participant Demographic Information: Key descriptive and sociodemographic information on each participant was collected.

Results

A total of 94 participants completed the study; they were evenly divided between the high (n=48) and low (n=46) engagement story versions. The manipulation of engagement levels between conditions was unsuccessful. Transportation scores, for example, did not vary significantly between those who read the “high” version (M=3.04, SD=0.5) and those who read the “low” version (M=3.0, SD=0.46; F=.308, NS). There was variation in transportation levels, however, across the entire sample. Consequently, the
Two conditions were collapsed and the entire sample was divided into two “naturally occurring” groups of high and low transportation. Participants scoring between 1 and 3.0 were considered to have been “low” in transportation (n=51) and those scoring between 3.01 and 5 were considered to be “high” in transportation (n=43).

### Table IV. Factor Loadings for the 13-item Narrative Engagement Processing Scale

<table>
<thead>
<tr>
<th>Items</th>
<th>Dimension 1</th>
<th>Dimension 2</th>
<th>Dimension 3</th>
<th>Dimension 4</th>
<th>Dimension 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor 1. Cognitive Arousal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It was easy to follow the action and events taking place in the story.</td>
<td>.837</td>
<td>.096</td>
<td>.102</td>
<td>.032</td>
<td>.192</td>
</tr>
<tr>
<td>I had difficulty making sense of what was going on. ( - )</td>
<td>.781</td>
<td>.122</td>
<td>.317</td>
<td>.163</td>
<td>-.042</td>
</tr>
<tr>
<td><strong>Factor 2: Absorption (α = .67)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>While reading the story, I lost track of time.</td>
<td>.060</td>
<td>.850</td>
<td>.039</td>
<td>-.027</td>
<td>.047</td>
</tr>
<tr>
<td>I am physically at my computer, but while reading the story...in the world created by the story.</td>
<td>.037</td>
<td>.770</td>
<td>.271</td>
<td>.100</td>
<td>.082</td>
</tr>
<tr>
<td>At times during the story, I completely forgot that I was in the middle of a study.</td>
<td>.368</td>
<td>.569</td>
<td>.058</td>
<td>.162</td>
<td>.153</td>
</tr>
<tr>
<td><strong>Factor 3: Focus (α = .72)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I often found myself thinking about other things while reading the story. ( - )</td>
<td>.078</td>
<td>.065</td>
<td>.870</td>
<td>.041</td>
<td>-.007</td>
</tr>
<tr>
<td>I had a hard time keeping my mind on the story. ( - )</td>
<td>.345</td>
<td>.236</td>
<td>.733</td>
<td>.067</td>
<td>.278</td>
</tr>
<tr>
<td>My attention was focused more on the story than on my surroundings.</td>
<td>.407</td>
<td>.196</td>
<td>.460</td>
<td>.076</td>
<td>.167</td>
</tr>
<tr>
<td><strong>Factor 4: Sympathetic Arousal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It was easy to understand why the characters reacted to situations as they did.</td>
<td>.172</td>
<td>.010</td>
<td>.080</td>
<td>.889</td>
<td>.103</td>
</tr>
<tr>
<td>I could understand why the character(s) felt the way they felt.</td>
<td>.024</td>
<td>.141</td>
<td>.033</td>
<td>.884</td>
<td>.152</td>
</tr>
<tr>
<td><strong>Factor 5: Empathetic Arousal (α = .65)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I could relate to at least one of the characters in this story.</td>
<td>-.116</td>
<td>.171</td>
<td>.219</td>
<td>.050</td>
<td>.812</td>
</tr>
<tr>
<td>I could easily imagine myself in the situation of some of the characters.</td>
<td>.337</td>
<td>-.066</td>
<td>.127</td>
<td>.209</td>
<td>.691</td>
</tr>
<tr>
<td>At certain moments in the story, I was feeling the same emotions the character(s) were feeling.</td>
<td>.392</td>
<td>.337</td>
<td>-.274</td>
<td>.200</td>
<td>.602</td>
</tr>
</tbody>
</table>

Note: The scores of reverse items were reversed for factor analysis. ( - ) Reverse-coded items.
Exploratory factor analysis was conducted on the thirteen items of narrative engagement. An initial inspection of eigenvalues and the scree plot suggested a five-factor model. Using a varimax rotation method, a principal components factor analysis with a five-factor solution was performed. The 13 item-scale, with 2-3 items representing each of the five dimensions, has a Cronbach’s alpha of .82 (see Appendix C for final scale). The final factor loadings are listed in Table 4. The loadings of the items in each dimension display the configuration as predicted. Simple correlations among the five dimensions are presented in Table 5.

According to Guttman’s definition (1944), a scale’s items must be shown to be a simple function of scores derived from the distribution. In order to approximate a Guttman scale then, items representing each of the five dimensions (Focus, Cognitive Arousal, Sympathetic Arousal, Empathetic Arousal and Apsorption) must elicit one of the following (ideal) response patterns: 1-1-1-1-1, 1-1-1-1-0, 1-1-1-0-0, 1-1-0-0-0, 1-0-0-0-0 or 0-0-0-0-0 where 1 equals agree and 0 equals disagree. In order to determine the extent to which response patterns obtained approximated the ideal, multiple combinations of items from each dimension were tested. Consistent with Guttman (1944), the tolerance for deviation was set at 15%. This means that at least 85% of obtained responses must fall within the ideal scale pattern.
The data provides partial support for hypotheses one and two. There does, indeed, appear to be a conditional relationship between focus and subsequent levels of cognitive arousal and absorption such that the majority of respondents who indicate high levels of focus go on to indicate higher levels of cognitive arousal. Similarly, the majority of respondents who indicate high levels of cognitive arousal go on to indicate high levels of absorption.

There were a total of eight combinations of items representing items from the Focus, Cognitive Arousal and Absorption dimensions (see Appendix D). Three variations met the criteria of a Guttman scale with 14-15% deviation. The other five variations, although not meeting the 15% point of tolerance for deviation, trend in the

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive Arousal</td>
<td>.48***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sympathetic Arousal</td>
<td>.29**</td>
<td>.21*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empathetic Arousal</td>
<td>.29**</td>
<td>.43***</td>
<td>.53***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Absorption</td>
<td>.40***</td>
<td>.34***</td>
<td>.32**</td>
<td>.34***</td>
<td>1</td>
</tr>
</tbody>
</table>

*significant at p<.05; **significant at p<.01; ***significant at p<.001

14 One of the three Focus items (“I often found myself thinking about other things while watching the program”) was excluded. Responses to this item indicated slightly lower levels of Focus on the stimulus; this could be due to the fact the question was a reverse-code item or simply due to the nature of the question and/or question wording.
expected direction with deviations no greater than 20%, providing further conceptual support.\textsuperscript{15}

To address research question one, answer patterns on items representing Cognitive Arousal were compared with those representing Affective (Sympathetic/Empathetic) Arousal. The relationship did not prove to be conditional (i.e. cognitive arousal necessary for affective arousal or vice versa) which suggests that cognitive and affective response to narrative content occurs simultaneously. There is, however, evidence for the additive effects of cognitive and affective arousal. Participants scoring low on either cognitive or affective arousal items were significantly less likely to indicate high transportation levels ($\chi^2=19.81$, $p<.01$).

Hypothesis three was supported, supporting the notion that that affective arousal is a necessary pre-condition for absorption. Affective Arousal scores were significantly related to Absorption scores, where higher levels of both sympathetic and empathetic arousal equated to higher absorption levels ($\chi^2=13.35$, $p<.05$ and $\chi^2=21.1$, $p<.05$ respectively).

\textit{Limitations}

This study has several limitations. For purposes of moving forward with validating the processing scale, and its Guttman qualities, these limitations are important to note.

\textsuperscript{15} These analyses do not take into account the possibility that observed answer patterns occur by chance; refer to post-hoc analyses on page 122.
However, for purposes of providing initial validation of the model and its sub-components, this study provides substantive insight.

The experimental manipulation involving transportation levels of the narrative did not work. Subsequent analyses were based on naturally formed groups of individuals reporting high versus low transportation instead of groups based on randomization. This may have introduced a threat to internal validity, specifically selection.

In addition, this study is reliant on a relatively homogenous convenience sample. External validity was compromised; many participants (i.e. friends and family) completed the study as a personal favor to the researcher. Therefore, motivation may have played a role in participant response patterns, whereas in a more natural environment, exposure and attendance/engagement patterns could vary.

The study uses a single text-based narrative. This prevents findings from being generalized to other textual narratives, as well as narratives presented in an audio/visual format, without further replication.

**D.2) Scale Development (Pilot Study III)**

Incidentally, additional data, collected during Pilot Study I, is available that replicates the results of Pilot Study II in an audio/visual context. The hypotheses and research question remain the same as in the previous scale development study.
Methods

Sample Characteristics

The final sample consisted of 29 participants (62.1% male). Nearly two-thirds of participants (65.5%) were between the ages of 18 and 35 years and the majority held a college degree (75.8%). Fifty-five percent of the sample identified as Caucasian, 34.5% identified as Black, 6.9% as other/multi-racial and 3.4% as Asian. Sixty two percent of participants reported a combined annual household income of less than $50,000. Fifteen percent of the participants reported a combined annual household income of more than $100,000.

Participants from a large, northeastern city were recruited through an online posting on Craig’s List in exchange for a small cash payment.

Stimuli and Apparatus

The three stimuli used during Pilot Study I were also used here; descriptions are available in Appendix A. Total viewing time for each clip was between 10-12 minutes.

As has been noted, these stimuli come from the network medical drama series ER. Medical dramas have consistently been popular with audiences (e.g. Grey’s Anatomy, Private Practice) and serve as an ideal starting point for this study as their narratives contain intense and emotional material. This variation provides subjects with a variety of content with which to engage, as well as a diverse cast with which to identify.
The video stimuli were viewed by participants in the Media Lab in the Annenberg School for Communication at University of Pennsylvania on 23” large flat panel monitors. The size and resolution of these monitors closely resemble the media systems with which a typical viewer might interact.

**Design & Procedure**

This was a within/between-subjects design with two experimental factors: Transportation (high versus low) and Narrative Content (HPV, BRCA1, Obesity).

Participation involved watching three stimuli. In order to prevent fatigue effects, subjects were randomly assigned to one of three conditions varying the order of Narrative Content (ABC, BCA, CAB where A=BRCA1, B=HPV and C=Obesity). Transportation was randomized within each sequence such that each participant received at least one High and one Low stimulus.

Participants arrived at the Media Lab and were seated at an individual viewing station. After reading an informed consent form, participants viewed three video stimuli. Immediately following each ER excerpt, subjects answered questions about their level of engagement. Also following each excerpt were items assessing the personal relevance of the narrative content and subjects’ familiarity with the program/episode prior to that day’s viewing. Participants also completed a personal questionnaire consisting of demographic items and several questions about media habits. At end of the study participants were debriefed and dismissed.
Measures (Select)

Narrative Engagement Processing Strategy: This contained a total of 13 items (please refer to Appendix A for a complete list). In order to allow for dichotomization, responses were measured using a 4-point ordinal format ranging from strongly disagree to strongly agree. For analyses, responses of strongly disagree and disagree were combined (0) and responses of strongly agree and agree were combined (1).

Transportation: Green & Brock’s (2000) 11-item Transportation Scale was used (α= .69 to .92). Items were modified to accommodate an audio-visual narrative since items were originally developed for text. Items were measured on a seven-point scale ranging from 1(strongly disagree) to 7 (strongly agree). Examples of items include “The story was so clear to me that I knew its smell, touch, and "feel" and “I had trouble visualizing the persons and places described in the story.”

Results

A total of 29 participants completed the study; ten participants viewed stimuli in ABC order (BRCA1, HPV, Obesity), ten viewed stimuli in BCA order (HPV, Obesity, BRCA1) and the remainder (n=9) viewed stimuli in CAB order (Obesity, BRCA1, HPV). Equal numbers of participants saw high and low (transportation) versions within each stimulus program.

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16 There were no differences in transportation levels based on the order of stimuli.
The manipulation of transportation levels (Hi versus Low) was unsuccessful. There were no significant differences, for any of the three conditions varying Narrative Content, in terms of transportation scores. Consequently, Hi and Low conditions were collapsed within each Narrative Content category, BRCA1 (n=29), HPV (n=29) and Obesity (n=29) and, unless otherwise noted, analyses treated all participants within each category as one sample.

**Comparison across Narrative Content**

Paired samples t-tests were carried out, comparing various combinations of Narrative Content on transportation levels. The tests revealed that there were no significant statistical differences among the three content areas; BRCA1 versus HPV ($t(28)=-1.1, \text{ NS}$), BRCA1 vs Obesity ($t(28)= -.22,\text{ NS}$) and HPV versus Obesity ($t(28)=.58, \text{ NS}$).

**Scale Development**

The 13-item NEPS scale proved to be reliable with Cronbach’s alphas of .80. Correlations between the proposed scale and individual CRM data (averaged) were run. In the BRCA1 and Obesity conditions, correlations ($r=.58$ and $r=.55$) were highly significant ($p<.001$) and in the HPV condition, the relationship neared significance ($r=.3, p=.12$).

Responses to the 13-item proposed NEPS scale were analyzed to see how closely they approximated a true Guttman scale. As described in Pilot Study II earlier, there are six response patterns that would suggest a hierarchical relationship between the
proposed dimensions of narrative processing. In order to determine the extent to which response patterns obtained approximated the ideal, multiple combinations of items from each dimension were tested. The tolerance for deviation was set at 15%. In other words, at least 85% of obtained response patterns must be one of the following: 1-1-1-1-1-1, 1-1-1-1-0, 1-1-1-0-0-0, 1-1-0-0-0-0, 1-0-0-0-0-0, 0-0-0-0-0-0.

Answer patterns from the same eight combinations of items representing the Focus, Cognitive Arousal and Absorption dimensions from Pilot Study II were reviewed. Consistent with data presented there, findings provide strong evidence for a hierarchical relationship between Focus, Cognitive Arousal and Absorption. Six of the eight combinations produced answer patterns consistent with a Guttman scale (refer to Appendix D). The other two combinations’ trends were in the expected direction, with 17.3% deviation, just above the 85% threshold set by Guttman (1944). These findings are consistent with those reported in Pilot Study II, providing conceptual support for the proposition that audiences progress through narrative in predictable ways.\(^\text{17}\) Hypothesis 1 was partially supported. Focus serves as a necessary pre-condition for cognitive arousal which, in turn, serves as a necessary pre-condition for absorption.

Research Question 1 was addressed by comparing response patterns to items tapping Cognitive Arousal and Affective Arousal (both sympathetic and empathetic). While there is no hierarchy to these patterns, suggesting that cognitive and affective

\(^{17}\) These analyses do not take into account the possibility that observed answer patterns occur by chance; refer to post-hoc analyses on page 122.
processing occur simultaneously, chi-square analyses reveal significant additive effects. Using an index of an individual’s total score on both Cognitive and Affective Arousal items, those scoring highly on these dimensions are significantly more likely to report high levels of transportation than low-scorers. This is true for both the BRCA1 and HPV conditions ($\chi^2=12.2(5), p<.05; \chi^2=11.2(5), p<.05$ respectively). The relationship reaches significance in the Obesity condition as well ($\chi^2=10.6(5), p=.06$).

Hypotheses 2 and 3 propose that absorption is conditional upon cognitive and/or affective arousal. The relationship between scores on the Cognitive Arousal and Absorption dimensions was non-significant although response patterns were in the expected direction.

There is partial support for hypothesis three. In two of the three Content conditions (HPV and Obesity), the higher one’s score on Affective (sympathetic and empathetic) Arousal items, the more likely s/he was to score higher on Absorption items ($\chi^2=17.1(8), p<.05; \chi^2=23.6(8), p<.01$ respectively). Given that affect appears to function somewhat independent of the other dimensions, affective arousal was compared against overall engagement. An index of affect was constructed, accumulating an individual’s scores across six sympathetic and empathetic arousal items. Individuals scoring higher on the proposed scale’s affective items were more likely to report high transportation across all three Content conditions. The relationship was significant in the HPV condition ($\chi^2=10.5 (4), p<.05$) and approached significance in the other two (BRCA1: $\chi^2=9.01(4), p=.06$; Obesity: $\chi^2=8.1(4), p=.09$).
Limitations

This study, like Pilot Study II, was not successful in its attempt to manipulate transportation levels among stimuli. In an effort to ensure that cancer-relevant content was identical between high and low versions for each Narrative Content condition, true variability in factors associated with variation in transportation (e.g. intense emotion, suspense, well-developed characters and/or storylines) was not viable. All participants were exposed to the storylines of: a character forced to choose between ongoing cancer treatment or prophylactic surgery; a sexually-active teen with HPV who, scared of her parents’ reaction, tries to commit suicide; and an obese young man whose refusal to change his lifestyle habits leads to him being rushed to the ER. Arguably, each of these storylines could lead an individual to respond to post-hoc measures of transportation and/or engagement favorably.

Also, the sample size of this study imposed several restrictions on data analysis. In several instances, low cell counts limited the ability to draw sound statistical conclusions.
V. Phase III: Application of the Model

The results of Pilot Study I indicate that engagement levels vary within episodes of entertainment narratives. The ability to marry continuous response data with audience feedback provided a richly detailed illustration of the various processes that are at work during one’s engagement with narrative. The findings offer support for the model of narrative flow proposed here.

The model, as described earlier, emphasizes the underlying dimensions of narrative flow and could be extended to aid in the identification and/or elucidation of particular segments within a narrative that might be characterized as “high” or “low” in narrative engagement. The model conceptualizes engagement as an individual-centered process, and does not address the formal features of narrative. What is most relevant for present purposes is acknowledgement that structural and/or content features can augment, or impede, narrative flow. By reviewing the literature on how several formal features of narrative independently effect memory, reasonable conclusions may be drawn about the main effects of engagement on memory. In the broader context of message design, knowing about the potential relationship between engagement and how easily key information is remembered is a necessary first step toward behavior change.
E.1) The (inverted-U) relationship between engagement and memory

Several theoretical frameworks are useful in guiding this line of research. Yerkes and Dodson (1908) are said to have presented the first research on the relationship between arousal and performance. Their investigation (using mice!) revealed a curvilinear relationship such that performance efficiency increased with low to moderate levels of arousal; at a high level of arousal, however, performance began to decline. This simple inverted U-hypothesis, known as the Yerkes-Dodson Law, has provided the framework for subsequent information processing theories. Two of these successors, resource allocation theory (Ellis & Ahsbrook, 1988) and Limited Capacity Model of Motivated Mediated Processing (LC4MP; Lang, 2006), address how formal features of narrative influence memory. Resource allocation theory assumes that an individual’s emotional state regulates the allocation of processing resources. Increased levels of arousal, then, can consume resources, sacrificing the quality of information processing due to a lack of sufficient resources. Along these lines, LC4MP recognizes that individuals are required to continuously allocate a finite pool of cognitive resources to various processes as they manage and make sense of messages. The quality of information processing is affected by the amount of cognitive resources allocated to the processing task at hand. What a viewer ultimately remembers from a television show is a function of how much of any given message is encoded, how much of the encoded information is stored, and how easily the stored information is retrieved (Lang, Newhagen & Reeves, 1996).
These three approaches can, and have, been applied to explaining the relationship between various structural and content features of narrative and memory. Most directly relevant is the significant body of research looking at the effect of emotion and memory. It is widely accepted that emotional arousal leads to an increase in the amount of resources allocated to message processing (Lang et al., 1999; Lang et al., 2003; Lang et al., 2000). The relationship between message content and memory of that content, however, is mediated by level of arousal. In effect, consistent Yerkes-Dodson Law and resource allocation theories, a state of arousal can impose additional processing requirements on the viewer. If the viewer does not have sufficient resources available, encoding may actually decrease as the resources are re-allocated from other tasks (e.g. storage of prior content; Lang, 1995; Thorson & Lang, 1992). Conversely, if the viewer has sufficient resources, arousal can enhance memory as additional resources are shifted from encoding (Lange et al., 1993; Thorson & Lang, 1992).

Empirical studies have tested the curvilinear relationship, manipulating levels of emotion/arousal through association tasks (e.g. Levinger & Clark, 1961) and mood manipulations (e.g. Blaney, 1986; Ellis & Ashbrook, 1989) and comparing emotional stimuli (e.g. slides, words, sentences, commercials) against neutral ones (e.g. Christianson, 1986; Bock & Klinger, 1986; Friestad & Thorson, 1985). Dependent on the level (high/low) of cognitive load imposed on the subject during exposure, emotional material produced a memory deficit or it enhanced memory. Consistent with resource allocation theory, studies that involved having subjects engage in specific cognitive tasks
while viewing stimuli may have caused them to spread their processing resources too thin. In a series of studies, Christianson and colleagues (1984, 1985, 1986), for example, exposed subjects to sets of slides containing emotional and neutral visuals. Images on these slides were accompanied by verbal descriptors. As subjects viewed the slides, they were instructed to select the descriptor they felt best fit each image. High arousal conditions resulted in reduced memory.

On the other hand, studies that simply exposed subjects to messages without imposing additional demands all reported enhanced memory for emotional material. Thorson and Page (1988) exposed subjects to a set of 12 commercials (6 high emotion, 6 low emotion), providing them with no instructions other than to watch the ads as they normally would. A significant effect on brand-name recall was reported, with commercials containing emotional material producing more product mentions by name than those without emotional material. Mattes and Cantor (1982) had similar findings, embedding commercial advertisements within programming that was either high or low in emotion. They proposed that the residual arousal, produced by the dramatic programming, explained increased product recall for ads contained within high emotion programming.

Despite a substantial amount of theorizing and empirical support for the relationship between emotion and memory, understanding the independent or combined effects of any number of message features on information processing is still an elusive endeavor. It is quite difficult to determine, a priori, what information
characteristics will produce optimal levels of arousal and, ultimately, recall of that information. To be sure, myriad message features and/or characteristics of the individual can affect the allocation of processing resources. Information characteristics to be addressed in this dissertation include visual versus verbal presentation and epoch, although there are certainly many others worth pursuing at a later date (e.g. vivid versus pallid, central versus peripheral).

**E.2) Possible effects of message modality on information processing**

Given that television is separated into two processing channels, various hypotheses have been offered to describe the impact of dual-modality on memory. Two hypotheses rely on the notion of hemispheric specialization, the tendency for different portions of the human brain to be more or less involved with processing different types of information. One suggests that recall and recognition of information presented in either visual or verbal channels is a function of emotional lateralization (e.g. Lang & Friestad, 1993). The second hypothesis suggests that hemispheric specialization does not necessarily produce differences in *accuracy* of visual and audio recognition but rather it affects response *latency* (e.g. Newhagen & Reeves, 1992). A third hypothesis proposes that structural features characteristic of highly arousing narratives (e.g. cuts, edits) make recall of visual information inherently more difficult. This is because the pace of highly emotional or arousing content results in material that stays on-screen for less time than in calmer moments (e.g. Lang, 1991; Attig, 1994).
Motivated by the classic dichotomy that the left side of the brain is associated with verbal processing and the right half with visual-spatial processing, researchers have attempted to account for variations in viewers’ attention, arousal and memory for messages. Within the domain of emotional lateralization, a considerable amount of evidence supports the claim that positive emotions are predominately processed by the left brain and negative emotions by the right (e.g. Reeves, Lang, Thorson & Rothschild, 1989). Lang and Friestad (1987, 1993) extended this research to consider whether emotional lateralization produced greater visual memory for negative messages and greater verbal memory for positive messages. Results were generally in the predicted direction, although the authors conclude that the effects of lateralization may have the greatest effect at the encoding stage.

In another study of the effects of emotional lateralization on memory, undergraduates received one of four versions of a 30 minute stimulus, sequencing 2-4 minute segments of popular film with 30-second PSAs (Reeves, Newhagen, Maibach, Basil & Kurz, 1991). The four movie-PSA combinations were (1) positive movie-positive PSA, (2) negative movie-negative PSA, (3) negative movie-positive PSA and (4) positive movie-negative PSA. Visual recognition was significantly greater for negative PSAs than for positive PSAs. There were no differences in accuracy of audio recognition. The authors do note, however, that positive audio segments were recognized more quickly than negative audio segments. In light of these findings, recognition will be measured for accuracy and latency.
H₁: Narrative flow has differential affects on verbal/visual recognition such that information presented during high engagement moments will produce greater visual recognition whereas low engagement moments will produce greater verbal recognition.

E.3) Possible effects of a message’s temporal position on information processing

Resource allocation theories can be used to explain another body of findings suggesting that temporal positioning of factual information can impact how well the information is remembered. Although encoding and storage processes can occur simultaneously, there remains the possibility that changing content and/or structural features of a message demand increased cognitive resources from an individual. Because encoding is a time-dependent process, an emotionally intense or arousing clip might lead a viewer to shift resources from a different task, such as storing previously encoded information. While the concurrent information benefits from an increase in resources necessary for encoding, the prior information may suffer from interrupted storage.

Newhagen and Reeves (1992) presented undergraduates with eight news stories, four containing negative images and four with neutral images. They report retroactive effects of highly compelling images on latency to recognition of visual material. Essentially, recognition was slower for information presented before compelling images than non-compelling images. The interaction between the position of key narrative material and the presence of compelling visuals, although not significant, was in the predicted direction. Whereas subjects who were only exposed to
non-compelling material achieved accuracy rates around 75% regardless of where
factual information was positioned (prior to, concurrent, following manipulation), those
exposed to arousing material could only remember information presented prior to
compelling content with 64% accuracy. Memory for information presented afterward,
however, improved (80%).

Later work by Lang, Newhagen & Reeves (1996), also using television news
stories, supports the hypothesis that high narrative engagement may interfere with
viewers’ ability to remember what happened before those periods. It may help them
remember what happened during periods of high engagement or immediately
following. This dissertation proposes that narrative flow will have differential effects on
memory, operationalized as recognition and free recall, dependent on the temporal
positioning of information.

H2a: Narrative flow will result in higher recognition and recall for information
presented during high engagement periods as compared with information just prior.

H2b: Narrative flow will result in higher recognition and recall for information
presented after high engagement periods as compared with information
presented just prior to or during these periods.

E.4) Possible effects of narrative flow on knowledge acquisition and persuasion

As discussed in previous sections, narrative flow is also expected to influence
educational and persuasive outcomes. This program explores individual differences in
story-consistent knowledge acquisition and belief change, hypothesizing that individuals
who experience high levels of narrative flow will exhibit:
H₃a: greater knowledge about the [BRCA1 gene mutation/human papilloma virus];

H₃b: positive attitudes regarding (i) the importance of early breast cancer detection, (ii) preventative surgery, and (iii) the importance of getting a second opinion;

H₃c: positive attitudes regarding (i) condom use, (ii) the importance of knowing a partner’s sexual history, (iii) the importance of disclosing one’s HPV status to his/her sexual partners;

H₃d: behavioral intentions to [undergo breast cancer screening/take preventative measures against HPV]

E.5) Further Considerations

Aside from providing support for the relationships among dimensions proposed by the flow model, findings from Pilot Studies II and III encourage the development of a self-report measure, with Guttman qualities. Although not the primary focus of this dissertation, the study proposed for Phase III will include the scale’s items in order to further validate its hierarchical nature. The significantly increased sample size will ensure adequate power and avoid the limitations imposed in Pilot Study III.

E.6) Application (Final Study)

Methods

Sample Characteristics

Female participants, between the ages of 18 and 35, were recruited from a metropolitan area using an online advertisement and word-of-mouth referrals. The final sample consisted of 115 women; participant ages were fairly evenly distributed with 53% of the sample between 18-25 years and 47% between 26-35 years. The
majority of participants were non-hispanic (n=107); whites represented the largest racial-ethnic group (54.8%), followed by blacks (30.4%). Most participants had completed some college coursework (39.1%) or had earned a bachelor’s degree (45.2%). Seventy-three percent of the sample reported income levels below $50,000/annual, likely a function of the young composition of this sample.

Design and Procedure

This was a mixed model counterbalanced design, allowing for replication of data using two unique health outcomes (BRCA1/breast cancer and HPV) and testing the nature and placement of stimuli segments previously determined to be high or low in engagement. The possibility for fatigue and/or testing effects was addressed by randomly assigning participants to one of two viewing sequences (AB or BA where A=Breast Cancer and B=HPV). Presentation order is a between-subjects factor whereas all other factors are within-subject.

Interested parties were provided with a link to an introductory website. Once participants read and provided informed consent, they were asked a series of true/false questions designed to provide a baseline measure of participants’ familiarity with a range of health topics, including the study topics: BRCA1 and HPV. Obtaining baseline data for cognitive outcomes of interest is ideal insofar as it provides stronger support for the effects of narrative content in isolation of exogenous factors. However, care was taken when asking these individuals such questions prior to exposure to the program so as not to cue them in to the topic and alter their viewing experience. Therefore, items
were presented as “screening” questions in order to mask their true purpose. All potential participants “passed” the screener and were directed to an online scheduling system that arranged for a study date at least one week later.

The study took place at the Annenberg School for Communication. Participants were seated at individual viewing stations. Participants were asked to watch two stimuli. While viewing each ER segment, participants provided continuous response data regarding their level of engagement with the content. Specifically, they were given the following instructions both verbally and on screen:

“I would like you to indicate how engaging the events and people in the show are by pressing the right and left arrow keys on your keyboard (visual included). By engaging, I mean that the events and people invite you to become mentally and emotionally absorbed in the story. If you think the events and people are engaging, press the key with the right arrow. The more engaging you think they are, the more often you should press the key with the right arrow. If you think the events and people are not engaging, press the key with the left arrow. The more disengaging you think they are, the more often you should press the key with the left arrow. Please keep pressing the appropriate keys to indicate your rating throughout the segment as things change.”

Participants were given an opportunity to practice the CRM reporting technique using four 30-second public service announcements. After viewing each ER segment, subjects were asked to count backward, in increments of three, from a randomly selected three-digit number for 20 seconds in order to clear short-term memory. They also completed a second distraction task which involved reading a brief excerpt from an unrelated ER segment and answering 14 items about the excerpt’s narrative structure. Participants then proceeded to the response survey. Survey items included recall and
recognition items relating to stimulus segments previously determined to elicit high or low levels of engagement (see Pilot Study I, Appendix B). These items addressed visual and verbal content both central and peripheral to the story. Additional memory items were generated to capture core health content that did not appear during (significantly) high or low engagement segments (see Appendix E for a complete list of recognition items). Participants were debriefed in accordance with IRB protocol and compensated $40 for their time.

**Measures**

*Retrieval/Free Recall:* To measure free recall, participants were asked to write down what they remembered from the episode (“Tell me about the episode you just watched”). Free-response recall items were coded to reflect whether recalled information came from high or low engagement segments and whether recall was from a health or non-health storyline. Responses were also coded to distinguish whether recalled information was from just before, during or just after a high engagement period. Recall relating to the BRCA1 segment was further coded to determine whether responses (a) specifically mentioned the BRCA1 gene and/or (b) included correct, incorrect or no reference to the two statistics included in the segment; having the BRCA1 gene indicates an 85% increased risk of breast/ovarian cancer and mastectomy reduces risk of breast cancer by 90%. Responses were also coded for the presence of any reference to family history. Recall relating to the HPV segment was coded for any mention of an HPV detection method - pap smear,
biopsy. Responses were also reviewed for acknowledgement that HPV does not, necessarily, lead to cervical cancer. The coding scheme distinguished between information that was accurately recalled (e.g. “The patient was diagnosed with lead poisoning”) and inaccurately recalled (e.g. “The patient was diagnosed with food poisoning”).

**Encoding/Recognition:** A total of 50 forced-choice recognition items required participants to indicate whether they remember seeing particular events from the episode by selecting “yes” or “no” as quickly possible. False events (n=15), extracted from *ER* storylines not included in this study’s stimuli, were (additionally) included to ensure the quality of participation (i.e. how closely participants watched the episode). **Recognition accuracy** was based on the percentage of items correctly identified on a forced-choice recognition test. **Response latency** was recorded using a time-log function of DirectRT, capturing the amount of time that lapsed until a participant selected an answer choice. That is, each recognition item was played/displayed on screen for a brief amount of time; from the moment the item was removed from the screen to the moment a participant indicated recognition by clicking “yes” or “no,” a timer captured his/her reaction time. Special attention was given to the first reaction time (RT), as participants may have needed to acclimate to the task, and to any outliers, defined as +/- two standard deviations from the mean (Ratcliff, 1993). As Luce (1986) advises, reaction times below 200 ms, the minimum
time needed for physiological processes such as stimulus perception and motor responses, were discarded.

*Persuasive outcomes:* Participants completed a series of questions aimed at measuring persuasive outcomes consistent with the programs, in order to determine whether exposure to cancer-themed content has educational and/or persuasive effects.

*Knowledge.* Participants’ general familiarity with health topics was measured prior to stimuli exposure. In the absence of a widely used measure of general health knowledge (Baker, 2006), thirteen items were selected to test basic knowledge on cancer-related behaviors such as smoking, drinking, exercise and nutrition (Williams, Baker, Parker & Nurss, 1998; Kenkel, 1991; $M=9.7$, $SD=1.8$). Post exposure knowledge of the BRCA gene and HPV was measured through a series of dichotomous questions. Knowledge of the risks of the BRCA gene mutation was measured by asking respondents whether they agreed or disagreed with the following three true(1)/false(2) statements: (1) “BRCA1 is a genetic mutation that indicates an increased risk of breast and ovarian cancer” ($M=1.02$, $SD=.13$); (2) “The BRCA1 gene increases a person’s risk of breast and ovarian cancer by 85%” ($M=1.11$, $SD=.32$); and (3) “Prophylactic surgery involves having one’s breast(s) removed. It decreases one’s chances of getting breast cancer by 50%” (correct answer is False; $M=1.8$, $SD=.41$). General knowledge of HPV was assessed by asking respondents the following three true(1)/false(2)
statements: (1) “Human papilloma virus (HPV) can cause cancer” ($M=1$, $SD=0$); (2) “Most people infected with human papilloma virus (HPV) do not realize they are infected or that they are passing the virus to a sex partner” ($M=1$, $SD=.09$); and (3) “To diagnose human papilloma virus, one must have a pelvic exam and pap smear” ($M=1.02$, $SD=.13$).

Attitudes. Attitudes about breast cancer were measured with the following question: “On a scale from 1 to 5, how much do you agree with each statement when thinking about breast cancer?” Respondents rated three items on a five-point Likert-type scale, where (1) = “strongly disagree” and (5) = “strongly agree.” The three attitude items were: (1) It is important to detect breast cancer early ($M=4.83$, $SD=.61$); (2) Having a mastectomy (surgery to remove the breast) is a good option for preventing breast cancer ($M=3.5$, $SD=1.2$); and (3) If someone is diagnosed with cancer, he or she should get a second opinion ($M=4.35$, $SD=.88$). Similarly, attitudes about HPV were measured with a 5-point scale (strongly disagree to strongly agree). The three items are: (1) Condoms are a good method of protecting oneself from contracting human papilloma virus (HPV) ($M=4.25$, $SD=1.1$); (2) Individuals should be aware of their partner’s sexual history before having sex with him/her ($M=4.79$, $SD=.5$); and (3) If someone has been diagnosed with HPV, he or she should notify all past and future partners ($M=4.72$, $SD=.73$).
Behavioral intentions. Respondents’ self-reported breast cancer screening intentions were measured. Respondents were asked, “How likely are you to do the following within the next 12 months?” Using a five-point Likert-type scale that ranged from “very unlikely” to “very likely” respondents rated the following items: (1) Get a mammogram\(^{18}\) \((M=2.82, SD=1.7)\); (2) Get a breast exam at my doctor’s office \((M=4.0, SD=1.31)\); (3) Recommend a breast cancer screening (mammogram or breast exam at doctor’s office) to a woman I know \((M=3.34, SD=1.42)\); and (4) Get tested for the BRCA gene mutation \((M=2.17, SD=1.41)\).

Respondents’ self-reported HPV prevention intentions will be measured using 5-point Likert-scales also. Items include: (1) Seek out information about human papilloma virus \((M=3.6, SD=1.3)\); (2) Use contraception during sexual activity \((M=4.5, SD=1.01)\); and (3) Consider a preventative HPV vaccine for myself and/or recommend a preventative HPV vaccine to a young woman I know \((M=3.67, SD=1.43)\).

Narrative Flow: Flow was measured using two unique scales. Transportation was measured using Green & Brock’s (2000) 11-item Transportation Scale (BRCA \(\alpha=.87\), HPV \(\alpha=.81\)). Items were modified to accommodate an audio-visual narrative since items were originally developed for text. All items were measured on a seven-point scale ranging from 1 (not at all) to 7 (very much). Examples of items include “While I was watching the narrative, activity going on in the room around me was on my

\(^{18}\) This item was dropped from analyses given the restricted age range of sample (18-35 years).
mind (reverse)” and “I could picture myself in the scene of the events described in the narrative.” The maximum transportation score possible was 77 (11 items x 7); the average score in BRCA was 48.2 (SD=12.0) and 56.5 in HPV (SD=9.5). For ANOVA purposes, transportation was median split into high and low groups (BRCA mdn=49, HPV mdn=56).

In addition, the processing strategy scale proposed in this dissertation was also used (BRCA α=.80, HPV α=.6). NEPS items were dichotomized (0=disagree, 1=agree); thus, the maximum NEPS score was 13 (13 items x 1) (BRCA M=10.3, SD=2.7; HPV M=11.76, SD=1.5). For ANOVA purposes, NEPS was median split into high and low groups (BRCA mdn=11, HPV mdn=12).

**Continuous Response Data:** Online ratings of engagement (1=completely disengaged, 9=completely engaged) were sampled once every 1/10 second. For each 1 second segment, the average rating was computed (BRCA M=6.33, SD=1.12, HPV M=6.95, SD=.9). For ANOVA purposes, participants’ CRM average scores were median split into high and low groups (BRCA mdn=6.43, HPV mdn=7.2).

**Issue Involvement:** Participants were asked to indicate their personal experience with various types of cancer and cancer-related outcomes (e.g. “A family member or someone close to me has been diagnosed with cervical cancer”; “I work on these issues through my job or volunteer work”). There were a total of six items. If a person responded that they had experience with a particular type of cancer or
outcome, they were given a score of 1. This way, a scale of personal experience was formed, ranging from 0 to 6 (BRCA $M=1.22$, $SD=.45$, HPV $M=1.15$, $SD=.4$).

**Media Use:** Participants provided, in minutes, frequency of television exposure on both a typical weekday (e.g. Tuesday, Wednesday; $M=116$, $SD=76.7$) and a typical weekend (e.g. Saturday, Sunday; $M=127.2$, $SD=95.4$). Participants were asked about the regularity with which they watch medically-oriented television such as *House, Private Practice, Grey’s Anatomy* and *Scrubs*. Finally, participants were asked to indicate whether they saw any of the stimuli prior to the study and, if so, how long ago. 89.6% of the sample had not seen the BRCA excerpt and 85.2% had not seen HPV. Of those who had seen the material before, less than 2% had viewed content within the past 12 months.

**Participant Demographic Information:** Descriptive and sociodemographic information on each participant was collected.

**Analysis Plan**

The proposed model of narrative flow emphasizes the narrative experience at the level of the individual. To be sure, characteristics of an individual, ranging from an affinity for dramatic medical programming to the ability to empathize, create a unique viewing experience. Findings from pilot work, however, suggest that there may be similarities in the ways that individuals experience narratives. Pilot Study III, for example, highlighted segments of two (edited) episodes of *ER* that elicited levels of engagement above or below the sample mean. These “significant events,” turned out
to be consistent across participants in both Pilot Study I ($N=29$) and in the final study ($N=115$). This finding resonates with research suggesting that certain message and/or content features (e.g. cuts, edits, pace, visual graphics, emotional intensity) affect cognitive and emotional response. (Lang, 1990). Indeed, the narrative itself may induce or inhibit flow.

In light of these findings, the relationship between narrative flow and memory was explored in two ways. The primary analyses explore how segments of the narrative, previously determined to be significantly high and low in engagement, affect recognition and recall. Post-hoc analyses compare the effects of individual variation in flow using self-reported transportation levels, the newly developed NEPS scale and continuous response data.

**Results**

A total of 115 subjects participated in the study; fifty-six viewed the BRCA stimulus followed by the HPV stimulus. The remaining fifty-nine subjects watched stimuli in reverse order (HPV, BRCA). There were no statistical differences between conditions in terms of sample demographics, media viewing habits, issue involvement or general health knowledge.

*Comparison between Health Topics*
Subjects reported transportation scores ranging from 16 to 72 ($M=48.2$, $SD=12.0$) after the BRCA stimulus.\(^{19}\) Scores ranged from 32 to 76 after the HPV stimulus ($M=56.5$, $SD=9.5$). A paired samples t-test was carried out, indicating a highly significant statistical difference ($t(114)=-7.32$, $p<.001$) in viewer transportation between the two ER segments. Scores on the proposed NEPS scale, as well as individual CRM data, support the finding that the HPV segment promoted higher levels of narrative flow and was rated to be considerably more transporting.

A within-subjects, repeated measures ANOVA was conducted to compare participants’ responses to scale items between the HPV and BRCA conditions. Participants’ responses to three items varied significantly between the BRCA1 segment and the HPV segment. On a 0 to 1 scale, where 0 = disagree and 1=agree, participants agreed it was easier to follow the action and events taking place in the HPV story ($M=.98$, $SD=.13$) than in the BRCA1 story ($M=.92$, $SD=.27$), $F(1,228)=4.7$, $p<.05$.

Participants reported that they were able to “…relate to at least one of the characters,” in the HPV segment ($M=.88$, $SD=.33$) more than in the BRCA segment ($M=.77$, $SD=.43$), $F(1,228)=5.1$, $p<.05$. A third difference in participants’ responses between excerpts involved agreement with the following statement: “I am physically at my computer, but while reading the story I was mentally and emotionally in the world created by the

\(^{19}\) Post-exposure measures of viewer transportation levels can range from 11 (minimum score) to 77 (maximum score).
story.” Participants had a higher rate of agreement for the HPV story ($M=.83$, $SD=.38$) than for BRCA1 ($M=.7$, $SD=.46$), $F(1,228)=4.8$, $p<.05$.

Trends in narrative flow were compared against those established in Pilot Study I. This was done in order to support the assumption that trends (i.e. periods of high and low engagement) are similar across two independent samples. Consistent with methods previously described, inter-rater reliability was established for the current sample ($\alpha=.98$, both stimuli). Average engagement trends for the sample in Pilot Study I and average engagement trends for the current sample are significantly correlated in both narrative content conditions ($r=.9$, $p<.001$ in BRCA; $r=.91$, $p<.001$ in HPV).

**Figure 5. Comparison of BRCA1 average CRM ratings: Pilot Study I v Main Study**

<table>
<thead>
<tr>
<th>Time (elapsed)</th>
<th>Engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0:01</td>
<td>3</td>
</tr>
<tr>
<td>0:38</td>
<td>4</td>
</tr>
<tr>
<td>1:15</td>
<td>5</td>
</tr>
<tr>
<td>2:29</td>
<td>6</td>
</tr>
<tr>
<td>3:06</td>
<td>7</td>
</tr>
<tr>
<td>3:43</td>
<td>8</td>
</tr>
<tr>
<td>4:20</td>
<td>9</td>
</tr>
<tr>
<td>4:57</td>
<td>8</td>
</tr>
<tr>
<td>5:34</td>
<td>7</td>
</tr>
<tr>
<td>6:11</td>
<td>6</td>
</tr>
<tr>
<td>6:48</td>
<td>5</td>
</tr>
<tr>
<td>7:25</td>
<td>4</td>
</tr>
<tr>
<td>8:02</td>
<td>3</td>
</tr>
<tr>
<td>8:39</td>
<td>2</td>
</tr>
<tr>
<td>9:16</td>
<td>1</td>
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<td>9:53</td>
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</tr>
<tr>
<td>10:30</td>
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<tr>
<td>11:07</td>
<td>2</td>
</tr>
<tr>
<td>11:44</td>
<td>3</td>
</tr>
<tr>
<td>12:21</td>
<td>4</td>
</tr>
<tr>
<td>12:58</td>
<td>5</td>
</tr>
<tr>
<td>13:35</td>
<td>6</td>
</tr>
</tbody>
</table>

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20 Selection of recognition items was based on this assumption
A visual inspection of the mean series and a comparison of significant events also supports that narrative flow is comparable across samples.

**Encoding Processes: Recognition Accuracy and Response Latency**

Prior to analysis, recognition items were grouped on a variety of characteristics. For example, items were grouped on the basis of whether a particular event occurred during a high engagement moment or during a low engagement moment. Items were also grouped based on their temporal position to a high engagement moment (pre-, during, post- or N/A)\(^\text{21}\). Finally, items were grouped in order to distinguish audio events from visual events and health-storyline events from non-health storyline events. A list of items and a table showing how they distribute across groups are provided in Appendix E.

\(^{21}\) The use of pre-produced stimuli from an actual television program imposed limitations here. It was impossible to come up with an equal number of events representing pre-/during-/post-high engagement. For example, it was not uncommon for there to be minimal audio or invariable imagery just before and just after high engagement periods.
Identification of foils, 15 false events extracted from a/v material not included in this study’s stimuli, was generally high (i.e. accurate). This suggests that participants were attending to the stimuli at some level. Foil identification was higher for the HPV segment than the BRCA1 segment. The HPV segment had four visual and four audio foils that were correctly identified 82.2% and 72.4% of the time respectively. There were three visual foils for the BRCA1 segment, correctly identified 69.9% of the time, and four audio foils, correctly identified 66.3% of the time. Taken together, visual foils were correctly identified as absent more often than audio foils.

There were a total of 25 recognition items from the BRCA1 segment. On average, respondents correctly identified 17 (M=17.3, 69.2%). There were a total of 25 recognition items from the HPV segment. Respondents correctly identified an average of 19 items (M=18.7, 74.7%). A within-subjects ANOVA found that recognition of HPV information was significantly greater than recognition of BRCA information, F(1, 226)=18.57, p<.001.

For the reaction time (RT) measures, outlying responses were identified as responses with RTs greater than two standard deviations from an individual’s mean RT in the task. Outlying responses and those falling below the minimum accepted time for physiological response (200 ms) were excluded from analyses. As is conventional, RT was measured only for accurate responses (Windsor and Hwang, 1999). To normalize the RT distribution, the RT data were log-transformed prior to statistical analysis.
Individual reaction times for BRCA1 recognition ranged from 483.2 to 2520.7 ms. The average RT was 1003.6 ms ($SD = 348.8$). For the HPV segment, the RT range was 610.68 to 3273.9 ms with an average of 1345.6 ms ($SD = 405.5$). This difference in RT between narrative content conditions is statistically significant, $F(1,226)=46.7, p<.001$.

Analyses using response latency as the dependent variable necessarily examined audio and visual events independently. This is because research shows variation in the amount of time required to process information presented in visual and audio format (Galton, 1899; Welford, 1980; Brebner and Welford, 1980). In general, the mean auditory reaction time is faster than the mean visual reaction time, perhaps because sound only takes 8-10 ms to reach the brain (Kemp, 1973) whereas light takes 20-40 ms (Marshall, Talbot & Ades, 1943).

Initial analyses examined whether participant recognition varied depending on where information was presented within the stimuli. Paired samples t-tests were used to compare participants’ abilities to recognize events that took place during high engagement moments versus those that occurred during low engagement moments. There were no significant differences in either the BRCA1 condition ($t(114)=-.26, NS$) or the HPV condition ($t(114)=.56, NS$); on average, participants correctly identified 68% and 75% of events (BRCA1 and HPV, respectively), regardless of whether they took place during a high/low period of engagement.
Reaction time analyses comparing latency to recognition in high versus low engagement periods is presented with audio/visual results below since it necessarily considers audio events and visual events independently.

Table VI. Recognition Accuracy during High and Low Engagement Periods

<table>
<thead>
<tr>
<th>Engagement Period</th>
<th>BRCA Mean Score (%) (SD)</th>
<th>HPV Mean Score (%) (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>68.35 (15)</td>
<td>75.3 (14.1)</td>
</tr>
<tr>
<td>Low</td>
<td>68.9 (16.7)</td>
<td>74.3 (13.4)</td>
</tr>
</tbody>
</table>

Visual versus Audio Presentation. Hypothesis One proposed an interaction effect between engagement level and communication modality (audio/visual). More specifically, H₁ proposed that during periods of high engagement, visual information would be recognized more often than audio information. Conversely, during periods of low engagement audio information would be recognized more often than visual information. Paired samples t-tests reveal that, regardless of high or low engagement periods, across both stimuli, there is a highly significant difference between recognition of visual events ($M=75$ (%), $SD=11$) and audio events ($M=69$ (%), $SD=9$; $t(114)=6.21$, $p<.001$). Visual events are correctly identified more often than audio events within high engagement moments (BRCA: $t(114)=3.0$, $p<.01$; HPV: $t(114)=1.79$, $p=.076$) and within low engagement moments (BRCA: $t(114)=2.53$, $p<.05$; HPV: $t(114)=3.2$, $p<.01$).
Further analyses were run to control for the possibility of structural confounds comparing, for example, audio-only recognition during periods of high engagement with audio-only recognition during periods of low engagement. As shown in table VII, audio-only recognition and visual-only recognition did not vary between high and low engagement segments of either segment.

DirectRT data was used to compare the amount of time it took participants to recognize visual events that were presented during periods of high or low engagement. Participants took longer to recognize visual events that took place during low engagement segments than they did for visual events that took place during high engagement segments in both the BRCA1, $t(114)=-1.72, p<.1$, and HPV conditions, $t(114)=-2.6, p<.01$, respectively.

A second comparison considered how much time lapsed before a participant was able to recognize auditory events. Here, participants’ reaction times were similar when comparing periods of high and low engagement. There was no statistical difference in the length of time it took for participants to correctly identify audio-based information.
Table VIII. Visual versus Audio Response Latency during High and Low Engagement Periods

<table>
<thead>
<tr>
<th>Engagement Period</th>
<th>BRCA1</th>
<th></th>
<th></th>
<th>HPV</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Visual Mean RT (in ms) (SD)</td>
<td>Audio Mean RT (in ms) (SD)</td>
<td>Visual Mean RT (in ms) (SD)</td>
<td>Audio Mean RT (in ms) (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>920.9* (440.8)</td>
<td>963.8 (762.1)</td>
<td>791** (301.9)</td>
<td>1704.6 (1000.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>1015.4* (614.5)</td>
<td>944 (652.4)</td>
<td>874** (353.9)</td>
<td>1790.4 (859.6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*marginally significant at p<.1; **significant at p<.01; comparisons are between rows within columns

**Temporal Positioning of Information.** Hypotheses 2a-b suggest that information presented during and/or just after a high engagement period will be better recognized than information immediately preceding. Given small n values, recognition items from both stimuli were combined. Paired samples t-tests reveal no differences between information presented just prior/during or just after a high engagement moment in terms of accuracy scores (see Table IX). These findings, however, are difficult to interpret at face value given the limitations of the data; analyses are restricted, in part, due to disproportion in the number of items representing pre-high engagement (N=3), during-high engagement (N=12) and post-high engagement (N=7). These findings are compared against free-recall data below.

Table IX. Paired Samples T-Test: Pre-/During/Post- High Engagement Recognition

<table>
<thead>
<tr>
<th>Epoch</th>
<th>Pre (Mean Score, SD)</th>
<th>During (Mean Score)</th>
<th>Post (Mean Score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Visual (73.5, 30.6)</td>
<td>Audio (NA)</td>
<td>Visual (75.4, 19.0)</td>
</tr>
<tr>
<td></td>
<td>Visual (75.7, 25.1)</td>
<td>Audio (67.8, 21.9)</td>
<td></td>
</tr>
<tr>
<td>Pre-</td>
<td>x</td>
<td>x</td>
<td>-.58</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>During</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

^ audio-only, pre- items n=0
There were no differences in participants’ reaction times to visual information, regardless of whether it was presented just prior, during or just after a high engagement segment. Audio events occurring immediately after a high engagement moment, however, took longer to recognize ($M=1455 \text{ ms}, SD=760.1$) than those occurring during a high engagement moment ($M=1242.2 \text{ ms}, SD=983$), $t(109)=3.86, p<.001$. If engagement is driven by strong visuals, this finding is not unexpected. Presumably, audio content post-engagement is less relevant and, therefore, not as accessible.

**Content: Educational versus Narrative Storylines.** Due to limitations in visual-only health events overall and audio-only health events in low engagement periods, comparative analyses of educational (i.e. health-based) storylines versus narrative (i.e. non-health) storylines are limited. Analyses combine data across stimuli and do not include visual-only analyses. First, a paired samples t-test was used to compare participant recognition of events representing the BRCA1 and/or HPV storyline against events from other non-relevant storylines. Participants recognized events from both educational storylines and narrative storylines an average of 72%, a difference that is not statistically significant, $t(114)=.42$. This finding holds true even when controlling for the possibility of structural confounds by considering audio-only events, $t(114)=-.03$.

While health information does not appear to be recognized more than information from other non-health storylines, findings do suggest that participants were more likely to recognize health information when it was presented during a low period.
of engagement ($M=72.46$, $SD=25.1$) versus a highly engaging period ($M=64.3$, $SD=34.2$), $F(1,228)=4.2$, $p<.05$.

Response times were faster for health information ($M=1275$ ms, $SD=650.1$) than for non-health information ($M=1457.2$ ms, $SD=627.4$), $t(114)=-3.1$, $p<.01$. A paired samples t-test was run to compare RTs for auditory health information in high or low engagement periods. Participants recognized health information during moments of high engagement moments at a significantly faster rate ($M=850$ ms, $SD=693.7$) than health information occurring during periods of low engagement ($M=1572.4$, $SD=1002.7$), $t(92)=8.2$, $p<.001$. Conversely, non-health events were recognized at a similar rate, regardless of whether the event took place during a high or low engagement moment ($M=1467$, $SD=762.4$ and $M=1439$, $SD=783.8$, respectively), $t(114)=.49$, NS.

Table X. Health versus Non-Health Response Latency within High and Low Engagement Periods

<table>
<thead>
<tr>
<th>Engagement Period</th>
<th>Health</th>
<th>Non-Health</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean RT in ms (SD)</td>
<td>Mean RT in ms (SD)</td>
</tr>
<tr>
<td>High</td>
<td>1275** (650.1)</td>
<td>1457.2** (627.4)</td>
</tr>
<tr>
<td>Low</td>
<td>1572.4*** (1002.7)</td>
<td>1439 (783.8)</td>
</tr>
</tbody>
</table>

**significant at $p<.01$; ***significant at $p<.001$; comparison of health/non-health is between columns; comparison of health/non-health within high and low engagement is between rows within columns

To recap thus far: It has been established that segments previously identified as eliciting and/or inhibiting engagement are comparable across two independent samples. Participants from the original pilot study and participants from this final study exhibited...
similar patterns in engagement, seemingly experiencing the narrative in similar ways. Self-reported transportation scores reveal that the HPV segment was considerably more engaging. In general, participants recognized more material from this segment. $H_1$ was partially supported. That is, visual information was recognized more than audio information in both the BRCA1 and HPV segments, regardless of whether it appeared during a high or low engagement moment. When considering visual or audio material independently, there were still no differences between high and low engagement. BRCA1 and HPV reactions times revealed that visual events, in particular, took longer to identify if they were presented during low engagement moments.

Hypotheses $2_{a-b}$ were not supported with recognition data. Rates of recognition, combined across both conditions, were similar regardless of whether information was taken from just prior, during or just after a high engagement moment. There were not enough items to consider visual material independently. However, when looking at response latency to audio information, RTs are longer when identifying events that took place immediately following high engagement periods as compared with events that took place in the midst of high engagement.

In order to compare health recognition versus non-health recognition, items were combined across conditions. Reaction times suggest that participants were able to respond quicker to health information that came from high engagement moments. However, health information presented during low engagement periods was (accurately) recognized more than the health material presented during high periods.
Retrieval Processes: Information recall

Analyses of participants’ ability to retrieve information contained within the study stimuli were based on 230 open-ended free recall measures; 115 were based on BRCA1 and 115 were based on HPV. Responses from each stimulus segment were analyzed separately. A comprehensive list of audio and visual events that took place within each ER segment was developed through an iterative process involving two independent researchers (see Appendix G). Participants’ responses were then coded for the presence or absence of each event, including whether or not the event was accurately or inaccurately recalled. In other words, recall is operationalized as the percentage of items accurately recalled over a base of all possible recallable items. Forty-six responses were independently coded by two coders to establish reliability (.8 < K < 1.0); the remaining responses were reviewed by a single coder.

Less than 7% of BRCA1 recall and less than 4% of HPV recall was inaccurate. In both narrative content conditions, errors in retrieval occurred most frequently in recall of health information presented during moments that were neither particularly high nor low in engagement (discussed below).

High versus Low Engagement.

BRCA. During segments that elicited significantly low engagement, participants’ recall ranged from 0% to 66.67% (M=15, SD=18, mdn=8.3). Recall during the high engagement segments ranged from 0% to 73.3% (M=19.6, SD=18.3, mdn=13.3). One of
the more frequently recalled events (n=66, 58%), involving an angry man lunging at his wife, took place here in a high engagement segment. A paired-samples t-test indicates a significant difference in the amount of recall produced during high and low engagement, \( t(113)=-3.2, p<.001 \). Participants recalled more material from high engagement parts of the ER clip.

**HPV.** Participants’ recall of information presented during (significantly) low engagement periods in the HPV segment ranged from 0 to 70\% (\( M=12.8, SD=16.2, \text{mdn}=5 \)). Of all possible events that could have appeared in participants’ responses, three of the events referenced the least (n=1, <1\%) occurred during low engagement periods. Incidentally, these were all verbal events (e.g. Mark tells bike rider he wouldn’t want to stand between him and his “personal path to brain death;” Liz asks her mother if she stayed up late watching Charlie Rose; Liz’’s mother responds “Not exactly”). The range of recall during high engagement periods of the HPV segment was 0 to 77\% (\( M=17.7, SD=17.9, \text{mdn}=7.7 \)). Two of the most frequently referenced events came from these segments: a young girl is re-admitted after overdosing on prescription drugs in a suicide attempt (n=78, 67.8\%); a hit-and-run patient is transported to the ER in a makeshift ambulance/plumber’s van (n=57, 49.6\%). High engagement periods in the HPV segment produced significantly more recall than low engagement periods, \( t(114)=-4.1, p<.001 \).
Temporal Positioning of Information.

Moving beyond recognition, Hypotheses 2\textsubscript{a-b} also proposed that information placement impacts recall. Hypothesis 2\textsubscript{a} predicted that information presented during high engagement moments would be recalled at higher rates than information immediately preceding. Hypothesis 2\textsubscript{b} predicted higher rates of recall for information appearing just after a period of high engagement as compared with the information just prior and during engagement.

BRCA. A repeated measures ANOVA was conducted to compare the effect of temporal position (e.g. pre/during/post high engagement) on information recall. Mauchly’s test indicated that the assumption of sphericity had been violated ($\chi^2 = 11.9$, $p < .01$), therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (epsilon = 0.91). The results show that recall differed significantly depending on where information was presented in relation to highly engaging segments of the BRCA segment, $F(1.8, 208) = 41.5$, $p < .001$. Post hoc tests revealed that information presented during periods of high engagement is recalled at a significantly higher rate ($M = 19.6$, $SD = 18.3$) than information presented both prior to ($M = 12.7$, $SD = 13.9$; $t(113) = -6.7$, $p < .001$) and immediately after ($M = 9.9$, $SD = 13.8$; $t(113) = 7.8$, $p < .001$). Worth noting is that the second most frequently recalled event, an angry husband lashing out at his wife, (N=66, 57.4%) occurred at the height of a high engagement moment. The difference between recall of material from just before and immediately after highly engaging content is also significant, $t(113) = 2.9$, $p < .01$. 
HPV. A repeated measures ANOVA was conducted to compare the effect of
temporal position (e.g. pre/during/post high engagement) on information recall.
Mauchly’s test indicated that the assumption of sphericity had been violated ($\chi^2 = 22.5, p < .001$), therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (epsilon = 0.85). The results show that recall differed significantly depending on where information was presented in relation to highly engaging segments of the HPV segment, $F(1.7, 195.7) = 33.8, p < .001$. Post hoc tests revealed that information presented immediately following periods of high engagement is recalled at a significantly higher rate ($M=28.2, SD=25.3$) than information presented both prior to ($M=16.1, SD=15.1; t(114)=-6.7, p<.001$) and during high engagement ($M=17.7, SD=17.9; t(114)=-6.2, p<.001$).

Figure 5. Recall of information based on temporal positioning
Content: Educational versus Narrative Storylines.

BRCA. The range of recall was similar for material relating to health and non-health storylines (0-62%). On average, participants recalled 19% of health information contained within the BRCA1 segment (SD=18.3) compared with only 13.8% of information contained within narrative storylines (SD=14), a statistically significant difference, t(113)= -4.4, p<.001. While several frequently recalled events occurred as part of non-health storylines (e.g. burn victim arriving at hospital, 65%, husband lashing out on wife, 57.4%), the majority of these narrative events were not as arousing and were barely referenced (e.g. interactions with the nurse manager, young patient asking for his mother, both <1%). On the other hand, several health events (e.g. patient diagnosed with BRCA1 gene, 33.3%, patient advised to get second opinion, 20.2%, preventative measures discussed 28.1%) consistently appeared in participants’ free response.

Despite eliciting greater recall than narrative storylines, educational health storylines contained two pieces of information that were recalled incorrectly more than any others. Approximately 19% of participants mis-remembered the name of the gene that indicates an increased risk of breast/ovarian cancer. Of these 22 individuals, 18 acknowledged the patient’s diagnosis, referring to BRCA1 as “pre-cancer gene” or “genetic mutation.” The remaining four made an attempt at citing the gene but got it wrong (e.g. BUPA). The second piece of information that was inaccurately recalled involved the statistic that BRCA1 indicated an 85% risk of breast/ovarian cancer.
Whereas 9 participants (7.8%) included the correct statistic in their open-ended recall, nearly 25% of all participants (N=27, 23.7%) were inaccurate in some regard. Three individuals provided the wrong statistic whereas sixteen generally noted that the patient had a gene that “almost promises”/“increases”/“makes it easier to get” breast or ovarian cancer without citing a specific probability of risk. Six participants made the incorrect assumption that having the BRCA1 gene means having cancer.

HPV. Recall ranged from 0 to 66.67% with regard to health storylines and 0 to 60.8% for non-health storylines. The average amount of health information recalled (M=21.7, SD=17.2, mdn=19) was significantly greater than the amount of information recalled from non-health storylines (M=14.4, SD=15.3, mdn=7.8), t(114)=8.26, p<.001. One-third of participants (n=38) acknowledged that HPV does not necessarily lead to cervical cancer. In contrast, this piece of information was mis-remembered more than any other (n=28, 24.3%). Ten percent of participants noted the detection method necessary to determine whether one’s HPV cells are cancerous (i.e. biopsy, n=11). The second most frequent error in recall involved confusing a pap smear (HPV detection) with a biopsy (cancer detection, n=4, 3.4%). Thirteen percent of participants noted the public health concerns related to HPV (e.g. transmission between sexual partners; n=15).

To recap thus far: In the absence of any prompts or fixed-answer choices, the information and details contained within participants’ free responses was, for the most part, accurate. In both BRCA1 and HPV conditions, participants referenced (recalled) information that took place during high engagement periods of the ER segments more
than during the low ones. As hypothesized (H2a-b), HPV recall corresponded with where in the ER segment information appeared. Information presented just after a high engagement moment was recalled at greater rates than information presented during the high engagement moment which, in turn, was recalled at greater rates than information appearing just prior. This was not the case for the BRCA1 segment. Here, recall of information that appeared immediately following high engagement periods was lacking.

Participants’ free responses contained more references to health-related content that narrative, non-health content. This must be interpreted with caution, however, given that recall was not always 100% accurate with regard to key health information. 

*Individual variation in narrative flow*

Until now, analyses have assumed variation in narrative engagement based on results from earlier pilot work that highlighted segments of the stimuli that were found to elicit/inhibit levels of engagement. A series of one-way ANOVAs were conducted to investigate the effects of *individual* variation in transportation levels, narrative flow (as measured by the proposed NEPS scale) and continuous engagement data.

There were several differences in recognition based on individuals’ average levels of flow. First, variation in engagement had a significant effect on how much information was remembered from the BRCA1 segment; individuals whose CRM data indicated above average levels of engagement during that segment scored higher ($M=17.7$, $SD=2.6$) than those whose average engagement was below average ($M=16.8$, $SD=2.6$).
General recognition of content from the HPV segment did not vary by individual variation in transportation, \( F(1,113)=0.14, \text{NS} \), narrative engagement, \( F(1,113)=0.27, \text{NS} \), or CRM data \( F(1,113)=2.7, \text{NS} \).

There were observed differences in overall recognition across both stimuli, based on the placement of information relative to high engagement periods of the narrative. These differences may be attributed to variation in transportation levels among viewers. Highly transported viewers recognized more information that took place during a high engagement moment (\( M=75.2, SD=14 \)) than viewers who were not as transported (\( M=69.25, SD=12.6 \), \( F(1,113)=5.75, p<.05 \)). In contrast, those who reported below average transportation levels were better able to accurately identify events, particularly visual events, that occurred immediately following high engagement segments, \( F(1,113)=3.4, p=.07 \).

There were also significant differences in reaction times that may have been driven by individual variation in flow. Individuals who were less transported took longer to identify visual information (\( M=981.7 \text{ ms}, SD=533.9 \)) from moments immediately following high engagement compared with highly transported individuals (\( M=785.7 \text{ ms}, SD=307.4 \), \( F(1,113)=5.63, p<.05 \)).

When considering participants’ recall, analyses of variance reveal variation in the amount of information remembered from post- high engagement segments of the BRCA1 segment. This variation is based on participants’ continuous response data, \( F(1,113)=4.7, p<.05 \). Post-high engagement recall rates were 12.6% (\( SD=15.9 \)) for
individuals whose average engagement levels were below the sample mean, a significant difference from the 7.14% recall rate (SD=10.7) for individuals with above average levels. Individual engagement levels (i.e. transportation, “flow”, CRM data) had no impact on rates of recall for material occurring pre-, concurrent, or post-high engagement periods in the HPV segment.

Differences in story-consistent knowledge acquisition and persuasion

Hypotheses 3 addressed the relationship between narrative flow and information acquisition. It was hypothesized that higher levels of engagement would be associated with greater knowledge about story content (i.e. BRCA1 and HPV). A one-way analysis of variance test was calculated on participants’ cumulative knowledge scores.

Knowledge. Four items measured post-exposure knowledge about the BRCA1 gene mutation and three items measured post-exposure knowledge about humanpapilloma virus. Participants’ scores on BRCA1 knowledge items were generally high. Most answered three (61.7%) or four items (12.2%) correctly. The majority of participants (97.4%) were able to correctly answer all three items about HPV. Knowledge scores did not vary by age, ethnicity, income or education and were not correlated with (pre-exposure) general health knowledge or issue involvement. Media viewing habits, specifically the frequency of medical program viewing, were associated

22 Subsequent analyses on knowledge acquisition focus solely on BRCA items due to lack of variance within HPV items.
with participants’ knowledge scores ($r=.20, p<.01$). Frequent consumers of medical television dramas had higher cumulative knowledge scores than individuals who watch medical television dramas less frequently, $F(1,113)=5.67, p=.019$.

ANOVA results indicate there were no significant effects of transportation, $F(1,113)=2.1, ns$, narrative Engagement $F(1,113)=1.9, ns$, or participants’ average CRM data, $F(1,113)=.01, ns$, in predicting subsequent knowledge scores.

Hypotheses 3b-c, predicted that variation in attitudes toward breast cancer and HPV might be attributed to variation in narrative flow.

**Attitudes (BRCA).** Attitudes toward early breast cancer detection were favorable. Nearly 98% of participants indicated agreement or strong agreement with the statement: *It is important to detect breast cancer early*. A second item prompted: *If someone is diagnosed with cancer, he or she should get a second opinion*. The majority of the sample (80%) agreed or strongly agreed. A third item measured participants’ support for mastectomy as a method of breast cancer prevention. A slight majority (53%, $n=61$) agreed that mastectomy is a good option. Just under 20% of the sample disagreed and close to 30% was undecided.

In order to address Hypotheses 3b, a one-way ANOVA was conducted, with attitude favorability as the dependent variable. Narrative Flow, analyzed using transportation, narrative engagement and individual’s average CRM data, had no impact on BRCA story-consistent attitudes. To ensure variance within participant scores, a summative measure of all three BRCA-related attitudes was created. There were no
significant correlations between this comprehensive score and individual measures of narrative flow. Participants’ recognition scores, reaction times and recall also failed to correlate with BRCA attitudes.

**Attitudes (HPV).** Attitudes toward transparency of sexual history and status were favorable. Approximately 96% of participants indicated agreement or strong agreement with the item proposing that *individuals should be aware of their partner’s sexual history before having sex with him/her*. Similarly, the majority of participants (93%) agreed or strongly agreed that *someone has been diagnosed with HPV, should notify all past and future partners*. A third item measured the extent to which participants agreed that *condoms are a good method of protecting oneself from contracting human papilloma virus (HPV)*. Although still generally favorable, approximately one-fifth (n=21, 18.3%) of the sample disagreed that condoms are a good method of HPV protection.

To test Hypothesis 3, an one-way ANOVA was run using attitude favoribility (High/Low) as the dependent variable. The relationship between narrative flow and HPV story consistent attitudes, while in the expected direction (i.e. higher levels lead to more favorable attitudes), was not significant. As was done for BRCA, all three HPV-related attitudes were summed to create a comprehensive attitude score. This score was not correlated with recognition, RT, or recall, narrative engagement or CRM data. It was, however, significantly associated with transportation ($r=.24, p<.05$), $F(1,113)=6.7$, $p<.01$. 

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Sequential multiple regression analyses were conducted to determine whether
the effects of transportation remained significant even when holding individual
demographics, health familiarity and experience constant. The final model, included
measures of transportation.

Table XI. Regression of Attitudes toward HPV detection/prevention onto
Demographics, Health familiarity and experience, and Transportation

<table>
<thead>
<tr>
<th>Measure</th>
<th>B</th>
<th>SE</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>11.7</td>
<td>1.74</td>
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</tr>
<tr>
<td>Race(^1)</td>
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<td>Education</td>
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<td>.22</td>
<td>-.06</td>
</tr>
<tr>
<td>Age</td>
<td>-.05</td>
<td>.35</td>
<td>-.01</td>
</tr>
<tr>
<td>Health Knowledge</td>
<td>.06</td>
<td>.09</td>
<td>.06</td>
</tr>
<tr>
<td>Personal Experience(^2)</td>
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<td>Frequency of Medical television viewing</td>
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<td>.05</td>
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<tr>
<td>Average transportation</td>
<td>.04*</td>
<td>.02</td>
<td>.2</td>
</tr>
</tbody>
</table>

\(R^2 = .03\)

* \(p<.05\)
1. Race was coded as follows: Non-white (0), White (1)
2. Personal experience was coded as follows: More than one personal/familial experience (1), One experience (0)

Accounting for 3% of the variance in women’s attitudes toward HPV prevention
and detection, \(F(7, 114)=1.4, NS\), the final regression model, which included
transportation, resulted in a significant increase in \(R^2, F(1,107)=4.0, p<.05,\) from
preceding models which did not. Regression coefficients are shown in Table XI.

Individual transportation levels continued to significantly predict attitudes even while
controlling for participant demographics and familiarity with general health/HPV related issues. \(^{23}\)

**Behavioral Intentions (BRCA).** Approximately one-third of participants (\(n=41\)) indicated that they were likely/very likely to get a mammogram within the next 12 months. Twenty percent were undecided (\(n=23\)) and just over 40% said that it was unlikely they would get a mammogram. Most participants (72.2%, \(n=83\)) said that they would likely get a breast exam at their doctor’s office within the next 12 months. Just over half of participants reported that they would likely recommend a breast cancer screening to a female friend or family member; thirty percent (\(n=35\)) do not intend to make a recommendation. Nineteen percent of the sample (\(n=22\)) reported an intention to be tested for the BRCA1 mutation. The majority of the sample (64.3%) said it was unlikely/very unlikely that they would seek (BRCA1) genetic testing.

Hypothesis 3 was partially supported as narrative flow was associated with participants’ intentions to engage in several story-consistent behaviors. While BRCA detection/prevention intentions were not correlated with recognition, RT, or recall, narrative engagement or continuous response data, transportation scores were significantly correlated with intentions to (a) recommend breast cancer screenings to female friends/family (\(r=.32, p<.001\)), (b) perform a breast self exam within the next 12 months (\(r=.27, p<.01\)) and (c) get tested for the BRCA1 mutation (\(r=.32, p<.001\)).

\(^{23}\) As with any observational data, these results must be interpreted with caution. While the present analyses consider several potential confounds (e.g. intrinsic motivation at the individual level), it is impossible to account for the range of all possible threats to inference.
series of one-way ANOVAs support that highly transported individuals were more likely than those reporting low levels of transportation to (a) make recommendations, \( F(1,113)=7.8, p<.01 \), (b) perform self-exams, \( F(1,113)=7.3, p<.01 \) and (c) arrange for genetic testing, \( F(1,113)=6.3, p<.05 \).

Sequential multiple regression analyses were conducted to determine whether the effects of transportation remained significant even when holding individual demographics, health familiarity and experience constant. The final model(s), included measures of transportation.

**Table XII. Regression of Intentions to recommend screening to female friends/family onto Demographics, Health familiarity and experience, and Transportation**

<table>
<thead>
<tr>
<th>Measure</th>
<th>B</th>
<th>SE</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
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<td>Health Knowledge</td>
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<td>Personal Experience(^2)</td>
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<td>television viewing</td>
<td>Avg. transportation</td>
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<td>.01</td>
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</tbody>
</table>

\( R^2 = .14 \)

\* \( p<.05 \), ** \( p<.01 \)
1. Race was coded as follows: Non-white (0), White (1)
2. Personal experience was coded as follows: More than one personal/familial experience (1), One experience (0)

Accounting for 14% of the variance in women’s intentions to recommend a breast cancer screening to female friends or family, \( F(7, 114)=3.7, p<.001 \), the final regression model, including measures of flow, resulted in a significant increase in \( R^2 \), \( F(1,107)=7.6, p<.01 \). Regression coefficients are shown in Table XII. With all other
variables held constant, individual transportation levels continued to significantly predict intentions to recommend screenings.

Table XIII. Regression of Intentions to get breast exam onto Demographics, Health familiarity and experience, and Transportation

<table>
<thead>
<tr>
<th>Measure</th>
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<th>SE</th>
<th>β</th>
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</thead>
<tbody>
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<tr>
<td>Education</td>
<td>-.14</td>
<td>.15</td>
<td>-.09</td>
</tr>
<tr>
<td>Age</td>
<td>.46</td>
<td>.25</td>
<td>.17</td>
</tr>
<tr>
<td>Health Knowledge</td>
<td>.012</td>
<td>.07</td>
<td>.02</td>
</tr>
<tr>
<td>Personal Experience²</td>
<td>-.01</td>
<td>.27</td>
<td>-.002</td>
</tr>
<tr>
<td>Frequency of Medical television viewing</td>
<td>.03</td>
<td>.03</td>
<td>.08</td>
</tr>
<tr>
<td>Average transportation</td>
<td>.03*</td>
<td>.01</td>
<td>.21</td>
</tr>
</tbody>
</table>

R² = .05

1. Race was coded as follows: Non-white (0), White (1)
2. Personal experience was coded as follows: More than one personal/familial experience (1), One experience (0)

Accounting for 5.5% of the variance in women’s intentions to get a breast exam in the upcoming year, F(7, 114)=1.9, p<.10, the final regression model, including measures of flow, resulted in a significant increase in R², F (1,107)=4.7, p<.05.

Regression coefficients are shown in Table XIII. Individual transportation levels continued to significantly predict breast exam intentions.

Table XIV. Regression of intentions to be tested for BRCA1 mutation onto Demographics, Health familiarity and experience, and Transportation

<table>
<thead>
<tr>
<th>Measure</th>
<th>B</th>
<th>SE</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.1</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Race¹</td>
<td>-.7**</td>
<td>.25</td>
<td>-.25</td>
</tr>
<tr>
<td>Education</td>
<td>-.4**</td>
<td>.15</td>
<td>-.24</td>
</tr>
</tbody>
</table>

* p≤.05
Accounting for 19% of the variance in women’s intentions to get tested for the BRCA1 mutation, \( F(7, 114)=4.9, p<.001 \), the final regression model, including measures of flow, resulted in a significant increase in \( R^2 \), \( F(1,107)=8.8, p<.01 \). Regression coefficients are shown in Table XIV. Individual transportation levels continued to significantly predict genetic testing intentions.

**Behavioral Intentions (HPV).** Over half of all participants (57.4%, \( n=66 \)) said they will seek out information about HPV. Less than 20% (\( n=22 \)) said it was unlikely/very unlikely that they would attempt to learn more about human papilloma virus. Two thirds of the sample were likely to consider a preventative HPV vaccine for themselves or recommending the vaccine to an eligible friend or family member; twenty percent said this was unlikely. The majority (87%) reported a high likelihood of using contraception during their next sexual encounter.

Here again there is support for Hypothesis 3a as narrative flow was associated with participants’ intentions to engage in several story-consistent behaviors. Although HPV prevention intentions did not correlate with recognition, RT, or recall, narrative...
engagement or CRM scores, transportation scores were significantly correlated with intentions to (a) seek information about HPV \((r=.26, p<.01)\) and (b) recommend the HPV vaccine to a young female friend or family member \((r=.25, p<.01)\). A series of one-way ANOVAs with Intention (Likely/Unlikely) as the dependent variable, support that highly transported individuals were more likely than those reporting low levels of transportation to educate themselves about HPV, \(F(1,113)=8.6, p<.01\) and recommend the HPV vaccine, \(F(1,113)=5.6, p<.05\).

Sequential multiple regression analyses were conducted to determine whether the effects of transportation remained significant even when holding individual demographics, health familiarity and experience constant. The final model(s), included measures of transportation.

**Table XV. Regression of Intentions to seek information about HPV onto Demographics, Health familiarity and experience, and Transportation**

<table>
<thead>
<tr>
<th>Measure</th>
<th>B</th>
<th>SE</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.3</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Race(^1)</td>
<td>-.54*</td>
<td>.24</td>
<td>-.21</td>
</tr>
<tr>
<td>Education</td>
<td>-.31*</td>
<td>.15</td>
<td>-.19</td>
</tr>
<tr>
<td>Age</td>
<td>-.36</td>
<td>.24</td>
<td>-.14</td>
</tr>
<tr>
<td>Health Knowledge</td>
<td>-.04</td>
<td>.06</td>
<td>-.05</td>
</tr>
<tr>
<td>Personal Experience(^2)</td>
<td>-.14</td>
<td>.29</td>
<td>-.04</td>
</tr>
<tr>
<td>Frequency of Medical television viewing</td>
<td>.004</td>
<td>.03</td>
<td>.01</td>
</tr>
<tr>
<td>Average transportation</td>
<td>.03*</td>
<td>.01</td>
<td>.22</td>
</tr>
</tbody>
</table>

\[R^2 = .14\]

*\(p<.05\)

1. Race was coded as follows: Non-white (0), White (1)
2. Personal experience was coded as follows: More than one personal/familial experience (1), One experience (0)
Accounting for 14% of the variance in women’s intentions to seek information about HPV, $F(7, 114)=3.7, \ p<.001$, the final regression model, including measures of flow, resulted in a significant increase in $R^2$, $F(1,107)=5.8, \ p<.05$. Regression coefficients are shown in Table XI. Individual transportation levels continued to significantly predict the likelihood one would attempt to learn more about HPV.

**Table XVI. Regression of Intentions to recommend HPV vaccine to young female friend/family onto Demographics, Health familiarity and experience, and Transportation**

<table>
<thead>
<tr>
<th>Measure</th>
<th>B</th>
<th>SE</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.7</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>Race(^1)</td>
<td>-.47*</td>
<td>.26</td>
<td>-.16</td>
</tr>
<tr>
<td>Education</td>
<td>-.15</td>
<td>.16</td>
<td>-.1</td>
</tr>
<tr>
<td>Age</td>
<td>-.5*</td>
<td>.26</td>
<td>-.18</td>
</tr>
<tr>
<td>Health Knowledge</td>
<td>-.03</td>
<td>.07</td>
<td>-.04</td>
</tr>
<tr>
<td>Personal Experience(^2)</td>
<td>.57*</td>
<td>.32</td>
<td>.16</td>
</tr>
<tr>
<td>Frequency of Medical television viewing</td>
<td>.07*</td>
<td>.03</td>
<td>.21</td>
</tr>
<tr>
<td>Average transportation</td>
<td>.03*</td>
<td>.01</td>
<td>.2</td>
</tr>
</tbody>
</table>

$R^2 = .155$

\(^*\ p<.05, \ + p<.1\)

1. Race was coded as follows: Non-white (0), White (1)
2. Personal experience was coded as follows: More than one personal/familial experience (1), One experience (0)

Accounting for 15.5% of the variance in women’s intentions to recommend the HPV vaccine to a young female friend or family member, $F(7, 114)=3.2, \ p<.1$, the final regression model, including measures of flow, resulted in a significant increase in $R^2$, $F(1,107)=4.0, \ p<.001$. Regression coefficients are shown in Table XVI. When holding all other variables constant, individual transportation levels remained a marginally significantly predictor of vaccine recommendation intentions.
To recap: Individual variation in continuous response measures is associated with differences in overall memory of BRCA1 material – higher levels of continuously recorded engagement correspond with higher rates of recognition. For information presented immediately following a high engagement moment, however, higher rates of recognition come from individuals with below average CRM scores.

Green’s transportation measure does considerably better in terms of predicting various outcomes. At the individual level, (high) transportation is associated with several attitudes and intentions that reflect content promoted within the BRCA1 and HPV segments. The impact of transportation on these persuasive outcomes remains statistically significant even when taking other influential factors into account.

**Scale Development**

For the BRCA segment, the 13-item NEPS scale proved to be reliable with Cronbach’s alpha of .80. Reliability was less than desirable, although satisfactory, in the HPV condition (α=.6). Possible reasons for this low alpha in the HPV condition were explored. The correlation matrix of variables in the NEPS scale suggested that several items in the scale, namely those representing the cognitive and affective arousal dimensions, did not correlate with other items. Distribution of participants’ responses to these items indicates that there is limited variability. For example, on a scale of 0 to 1, where 1 represents full agreement, the mean response to two cognitive items 1 (i.e. It was easy to follow the action and events taking place in the story; I had difficulty making sense of what was going on) and one sympathy item (I could understand why the
character(s) felt the way they felt) ranged from 0.97-0.99 with standard deviations .09 -.16. This lack of variance is not surprising given the highly transportive nature of the HPV segment. There is modest improvement in scale reliability when removing these items ($\alpha=.62$).

Correlations between the proposed scale, Green’s existing Transportation scale and individual CRM data (averaged) were run (see Table XII). In the BRCA1 condition, correlations between on-line continuous response and both transportation and NEPS measures ($r=.5$ and $r=.53$) were highly significant ($p<.001$). In the HPV condition, individuals’ average CRM scores were correlated more highly with their score on the proposed NEPS scale ($r=.12$) than with their transportation score ($r=.04$) but neither relationship neared significance. The correlation between CRM data and transportation improves ($r=.14$) when dropping two low variance items.

**Table XVII. Correlations among Narrative Engagement Measures**

<table>
<thead>
<tr>
<th></th>
<th>Transportation (BRCA/HPV)</th>
<th>NEPS (BRCA/HPV)</th>
<th>Average CRM (BRCA/HPV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation (BRCA/HPV)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEPS (BRCA/HPV)</td>
<td>.79***/.56***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Average CRM (BRCA/HPV)</td>
<td>.53***/.04</td>
<td>.5***/.12</td>
<td>1</td>
</tr>
</tbody>
</table>

***Significant at $p<.001$  

Similar to the process used in Pilot Studies II and III, participants’ responses were examined to determine whether they exhibited hierarchical trends. For example, did

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24 The HPV Transportation scale was likewise adjusted, from 11 items 9 items, to account for lack of variance.
participants who indicated Absorption necessarily indicate Cognitive Arousal and Focus?

There were a total of eight combinations of items representing the Focus, Cognitive Arousal and Absorption dimensions of the proposed model of narrative flow. Again, the tolerance for deviation was set at 15% (Guttman, 1944). First, responses related to the BRCA1 segment were considered. Four variations met the criteria; the remaining four variations trend in the expected direction, with deviation between 16-18%. With regard to the HPV segment, all eight variations had less than 7% deviation from the ideal response patterns (0-0-0, 1-0-0, 1-1-0, 1-1-1). These results are consistent with the propositions set forth in the proposed model of narrative flow. While viewing a highly transportive program (HPV), viewers progressed through flow in a predictable fashion – once the program was attended to, cognitive and affective arousal took place which, in turn, led to absorption.²⁵

Discussion

This dissertation investigates how individuals process information presented in narrative form. Moving beyond assumptions of effect (i.e. whether people learn from narrative), the research presented here considers key influence mechanisms through which entertainment media cultivates change (i.e. how do people learn and under what conditions). Specific goals of the research included (1) developing and validating a model of narrative flow, capturing the multi-dimensional process of audience

²⁵ These analyses do not take into account the possibility that observed answer patterns occur by chance; refer to post-hoc analyses on page 122.
engagement; and (2) determining the extent to which narrative flow impacts processing, acquisition of cancer knowledge and story-consistent belief change.

The model of narrative flow outlined in Section C of Phase 1 proposes four unique dimensions in narrative processing: Focus, Cognitive Arousal, Affective Arousal (sympathetic and empathetic) and Absorption. These dimensions represent complex sub-processes that are part of an even more complex experience. Indeed, while there is support for the model’s successful characterization of the psychological processes involved, narrative processing is also affected by individual characteristics, environmental factors and features of the narrative itself.

In order to explore the nature of and relationships between various sub-processes that occur as an individual engages with narrative communication, several methodological approaches were employed. In Pilot Study I, continuous response data was complemented by an interviewing technique that encouraged individuals to reflect about their thoughts and feelings during key moments (i.e. increases/decreases in flow). A sorting task, completed by a team of independent evaluators, showed that the reasons viewers gave when describing their shifts in engagement aligned closely with the dimensions of flow set forth in the proposed model. That is, viewers indicated that their levels of engagement varied as a function of their (a) focus toward the story’s characters and events, (b) cognitive appraisal of characters and events, including contextualization and assessments of realism, and (c) ability to identify with characters and their situations.
In Pilot Studies II and III, as well as in the final study of Phase III, an alternative validation technique was employed. Based on the proposition that the process of achieving flow may occur in a step-wise fashion, items were carefully developed and selected to create a scale with Guttman-like composition. Ideally, answer patterns would reflect a progression through the model’s dimensions such that an individual who indicated having experienced a higher-order dimension (e.g. Absorption) will have also indicated having experienced a lower-order dimension (e.g. Focus, Cognitive Arousal).

Participants’ answer patterns, across these three separate studies, suggest a relationship among at least three of the model’s four dimensions that is reflective of an increasing difficulty in narrative sub-processes. In other words, respondents who indicated high levels of Focus go on to indicate higher levels of Cognitive Arousal. Similarly, the majority of participants who indicate high levels of Cognitive Arousal go on to indicate high levels of Absorption. And while Affective Arousal appears to be a necessary pre-condition for Absorption, the relationship between Affective Arousal and Cognitive Arousal is less clear. Rather than Cognitive Arousal being a stepping stone for Affective Arousal, it is likely that they occur simultaneously. In fact, a robust line of inquiry within the social cognition literature has demonstrated that, indeed, emotional response need not be mediated by any cognitive assessment (Clore, Schwarz & Conway, 1994; Zajonc, 1980, 1984a, 1984b). The work presented here suggests additive effects, such that experiencing higher levels of both cognitive and emotional arousal increases the likelihood of flow.
Given that observed answer patterns were consistent with patterns that one would expect from a true Guttman scale, an additional assessment metric was applied. Post-hoc analyses calculated Menzel’s coefficient of scalability. This coefficient, valued between 0 and 1, accounts for the possibility that observed relationships among items in a scale occur by chance. The coefficient of scalability for the scale representing the Focus, Cognitive Arousal and Absorptions dimensions ranges from .33 to .48. These levels are below the standard levels of acceptance, typically beginning at .6 to .65 (Menzel, 1953).

Although these items may not constitute a true Guttman scale, the Narrative Engagement Processing Strategy (NEPS) scale was determined to be reliable in both text and audio/visual contexts (.6 > α > .82). There is evidence of convergent validity insofar as there was a consistent and significant correlation between individuals’ real-time engagement while watching the BRCA1 segment and scores on the newly proposed scale. The relationship neared significance in the HPV condition of Pilot Study III as well.

Taken together, the results of Pilot Studies II and III and the final study in Phase III provide support for the proposed model of narrative flow. Some might criticize the use of continuous response measurement as a validation technique, arguing that it interrupts the experiential state of flow. Continued research might involve addressing possible confounds between attentional networks and flow states. This could be done by utilizing secondary tasks or, a comparative analysis could be conducted, looking at a group asked to provide continuous data against an exposure-only group.
In addition, further replication and validation work is necessary to advance the utility of the NEPS measure as a means of capturing an individual’s progress through the narrative experience. Next steps should address insufficient variation in several of the proposed items. In some ways, the proposed cognitive items challenge the very nature of (well-constructed) narratives, for example, asking whether it was easy to follow the action and events. These items should be re-written to more pointedly get at issues of realism, a “deal-breaker” when attempting to maintain consistent levels of cognitive arousal. Alternatives might include: “The program was logical and convincing;” “At some points in the program, it was not clear why something happened.” Another item with low variance was “I could understand why the character(s) felt the way they felt.” Without tailoring emotion to each individual stimulus (e.g. I was worried/excited about), a substitute might be “I was interested in finding out what would happen to the character(s).”

Once concerns about insufficient variation within scale items are addressed, confirmatory factor analysis (CFA) may be useful. Confirmatory factor analysis can provide further confirmation that the psychometrics of a scale early in its development are strong (Maruyama, 1998).

Effects of Engaging Content on Memory

Phase III of this dissertation explored the relationship between narrative flow and several outcomes of interest, namely memory and information acquisition. Memory was operationalized in two ways – recognition and recall. Following the
counsel of Newhagen and Reeves (1992) latency to recognition was also considered in select instances insofar as it is more sensitive to variation than recognition accuracy.

There were significant differences in viewer engagement between the two stimuli used. This is unsurprising given that the stimuli address two different health topics and can vary on any number of factors including emotional intensity, pace, resolution and imagery. Worth considering, however, are consistent patterns across stimuli in spite of these differences.

A question that surfaces often in discussions concerning narrative engagement is whether engagement improves the likelihood one will remember thoughts, words or actions from specific moments within a narrative? Presumably, the loss of self-consciousness and temporal distortion that accompany a state of flow (Nakamura & Csikszentmihalyi, 2005) could make remembering information from highly engaging segments of a narrative more difficult. On the other hand, someone who is paying attention, understands what is going on, and likes the character may have an easier time of digesting the information presented and face fewer distractions. Indeed, there is research that demonstrates a link between an individual’s self-reported transportation and story-consistent change (Green and Brock, 2000; Green, 2004).

Similar to these findings, the present research indicates that viewers remember more information from high engagement moments than from low engagement moments. Because of this, stimuli were analyzed separately whenever possible.

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26 Because of this, stimuli were analyzed separately whenever possible.
moments. Recall effects were highly significant and were present in both the HPV and
BRCA1 stimuli.

Recognition did not vary between high and low engagement segments of the
stimuli, however, when taking individual variation into account, there is some evidence
that general recognition is moderated by flow. Participants whose CRM data indicated
above average engagement had higher recognition scores than those whose
engagement levels were below average.

Failure to find effects between recognition in high engagement segments and
low engagement segments prompted a post-hoc analysis. As detailed earlier, there is
strong evidence to suggest reliability in CRM data across participants and across
samples. However, this is not to say that each individual’s engagement “profile” is as
similar to the aggregate profile as every other individual. Correlations between
standardized CRM data for each participant and the aggregate sample’s CRM data are
generally positive and strong. In the BRCA1 condition, there were eight participants
whose engagement profile correlated with the aggregate profile at 0.1 or less. In the
HPV condition, there were six participants. Comparability of recognition between high
and low engagement segments was re-visited, eliminating those participants whose
viewing experience deviated from the sample as a whole. Here, rates of recognition are
significantly greater for high engagement periods ($M=6.86$ out of 9 items, $SD=1.48$) than
low engagement periods ($M=6.18$ out of 9 items, $SD=1.52$), $t(106)=3.3$, $p<.001$. The
difference in recognition was in expected direction for HPV yet not statistically
significant, $t(108) = .71, NS$.

This suggests that, like recall, recognition may be positively associated with
program segments that elicit high engagement. Perhaps with a larger sample the
distinction would be more observable. That these results were produced by eliminating
select individuals, however, raises a subsidiary point. What is it about the fourteen
individuals that experienced the narrative in a way unlike the majority of viewers?

Reaction times were noticeably faster when participants were identifying visual
content from high engagement moments than low engagement moments. In effect,
visual images are more easily retrieved from short-term memory when they are
associated with highly engaging content. Engagement, then, increases accessibility of
(visual) information.

*Effects of Content Modality on Memory*

Television’s dual modality presents unique issues concerning how viewers
respond to information presented in audio and video channels, both independently and
in combination with one another. In the final study, Hypothesis One proposed an
interaction effect between message modality (audio/visual) and engagement
(high/low). Specifically, it was hypothesized that narrative flow would have differential
effects on memory such that high engagement would be associated with greater visual
recognition and low engagement with greater audio recognition. This hypothesis was
only partially supported; in fact, visual events were accurately identified more than
audio events, regardless of whether they came from high or low engagement moments. This preference may be attributed, in part, to the emotional nature of the visual content within both the HPV and BRCA1 stimuli. For example, some of the most provocative material was visual: a close-up of a little boys bruised and bloody face, a hit-and-run victim rushed to the ER in a makeshift plumber’s van-turned-ambulance, a father’s reaction as he realizes his son is in critical condition. Highly intense and visual imagery demand increased processing resources, therein leaving fewer resources for encoding of extraneous (i.e. audio) events. Video material may simply be more salient and memorable (Pezdek and Stevens, 1984).

Support for superior memory of visual information over audio information is, in fact, robust. Within intact television programs, scholars have repeatedly documented a preference for visual information, as indicated by higher memory and comprehension rates (Hayes and Birnbaum, 1980; Zuckerman, Ziegler and Stevenson, 1978).

It should also be noted that the differences in rates of audio and visual recognition accuracy could be an artifact of the items themselves. While care was taken to generate recognition items that were similar along many dimensions (e.g. relative position to high/low moments, gender, close-ups v. full body stills, relative importance in narrative, presence of background music/noise, length of audio clip etc.), there was simply no way to guarantee the comparability of items. Any number of factors could have affected the degree of difficulty between items.
Newhagen and Reeves (1992) note that neurologically-based differences in processing audio and visual information may not be evident in accuracy measures, but rather in response latency. While there were no differences in the amount of time it took participants to identify auditory events from high versus low engagement moments, there was statistically significant variation in reaction times to visual events. On average, reaction times were slower when identifying visual events that took place during a low engagement moment. In correspondence with $H_1$, viewers experienced more difficulty when asked to identify visual events that took place during periods of low engagement than periods of high engagement.

These results are important in that they further emphasize the utility of narrative in addressing a wide range of topics. Narratives can showcase credible characters in realistic scenarios that equip individuals with the practical know-how and confidence to overcome bases of resistance. The preference for visual content suggests that, when creating messages, writers/producers may benefit from presenting critical information visually. For example, instructional media or campaign materials might employ symbolic modeling rather than verbal persuasion-based messages. Television dramas might incorporate (more) characters performing healthy, pro-social behaviors (e.g. using an infant or child car seat, changing the batteries in a smoke detector or getting an H1N1 vaccine).
Effects of Content Position on Memory

A second set of hypotheses (H2a−b) in the final study proposed that information presented during and/or just after a highly engaging segment would be remembered more than information immediately preceding. Recognition data did not support either hypothesis. On average, participants achieved accuracy rates around 75% for visual recognition and 68% for audio recognition regardless of where information was positioned (prior to, concurrent, following high engagement). Once individual differences in engagement were taken into account, however, there was some variation. Viewers who reported experiencing higher levels of transportation achieved higher accuracy rates for material that was presented in the midst of high engagement than their less transported counterparts. The opposite is true, however, when looking at recognition of visual material that appeared just after a high engagement segment – individuals who did not experience high levels of transportation took longer to respond, but had higher rates of accurate identification. There may be an adjustment period as participants in a high flow state re-gain their consciousness, shifting gears, so to speak, from being a part of the story to being a passive viewer. This would explain why individuals not as absorbed in the story had an easier time accurately recognizing events that occurred immediately following high engagement moments.

Aside from these individual differences, the general lack of findings in participant recognition may be attributed to limitations imposed by the stimuli used. By relying on pre-produced stimuli from an actual television program, recognition items were
necessarily selected from existing material rather than constructed to meet the needs of the researcher. This resulted in disproportionate numbers of items representing pre/during/post high engagement moments. For example, just before and just after high engagement periods it was not uncommon for there to be minimal audio (e.g. physician is quiet after digesting information provided by patient) and limited visual imagery (e.g. two shots, one of a patient and one of a physician, that alternate back and forth).

Results from participant recall data are less tentative. There is partial support for Hypothesis 2\textsubscript{a}. In the BRCA1 segment, participants were able to recall more information presented during high engagement periods of the narrative than information immediately preceding. Recall rates between pre- and concurrent high engagement periods, although not significant, were in the predicted direction for the HPV segment as well. Resource allocation theories would suggest that the shift from a less engaging storyline to material that is more arousing and/or emotionally intense would demand increased cognitive resources from an individual (Ellis & Ashbrook, 1988; Lang, 2006). In the process of re-allocating resources to the goings-on of the high engagement moment, then, the storage of previously encoded information presented just prior appears to have suffered.

Hypothesis 2\textsubscript{b} is partially supported. Retroactive interference is evidenced in participants’ recall in the HPV condition; whereas recall rates of information were at 16\% for information presented just prior to high engagement moments and around 18\%
for information presented concurrently, recall of post-high engagement content jumped to over 28%. Curiously, the relationship between concurrent recall and post recall is opposite in the BRCA1 condition.

The transportive nature of the HPV segment may account for the significant differences in post-engagement recall between the two ER segments. Recall ranged from 28-29% in the HPV condition and 8-11.5% in the BRCA condition. This does not explain, however, why post-engagement recall decreases in the BRCA1 condition and increases in the HPV condition. When considering individuals’ average level of engagement during each ER segment no obvious interactions were apparent. In both cases, individuals who were less engaged scored slightly higher, recalling more audio/visual events than individuals who were more engaged. It may be that the nature of high engagement content placed excessive demands on participants, maximizing allocation of their cognitive resources and stretching the limits of their information processing systems (Lang, 2006). Having reached this “threshold,” the individuals most engaged with content as it was presented may have had the most difficulty remembering information presented immediately afterwards.

Similar to the limitations created by not having equivalent recognition items across conditions, an alternative explanation for post-recall differences between ER segments may be that information from one segment is inherently more memorable. For example, suppose there were a witty comment or a graphic visual in the moments immediately following high engagement moments in the HPV segment; post-recall may
have been inflated as a result of this content, not present in the BRCA segment. While the expected pattern of results was not obtained in BRCA1 recall, it was evident, and robust, in HPV recall. Another plausible explanation for the unexpected divergent trends involves precipitous drops in engagement levels following high engagement periods in the BRCA condition. A particularly high moment in the show was followed by a steep drop in engagement levels. In fact, this “turning point” represents the steepest fall within any 30-second period by nearly 30%. These unexpected results in recall then may be the result of poor editing on the part of the researcher. Although precautions were taken to maintain continuity and ensure smooth transitions, there were instances where material was edited from its original format to meet time constraints. These changes could have resulted in transitions between high engagement moments and the content immediately following that were too radical and/or abrupt.

With that in mind, if the position of key narrative material does, in fact, matter, there are practical implications for message design that should be noted. Some might believe that the key to successful persuasion is to lead with statistics, to establish credibility and present what one believes to be a high quality argument before any compelling imagery. The logic behind this is that attention/comprehension is not sacrificed by distraction. Another common presumption is that recall of important information increases when the information is paired with highly engaging content. People confound attention and arousal with comprehension, thinking, “After all is said and done, won’t everyone be talking about that scene?” A more informed strategy for
producing educational or persuasive messages would be to allow time between highly engaging/compelling material and the presentation of critical information.

*In the context of health*

This dissertation positions itself within the context of public health, specifically focusing on cancer outcomes. The stimuli used contained health messages about HPV and the BRCA1 gene. Recognition and recall between storylines that contained key health information and those that did not were compared in order to determine how contextualized information might affect information processing. In addition, message-specific cognitive outcomes were examined in order to determine the extent to which narrative flow impacted persuasion.

Rates of recognition were higher for health information appearing in a low engagement moment than in a high engagement moment. This makes sense insofar as health information is oftentimes complex and more difficult for individuals to process. This type of information generally requires more cognitive resources for encoding than an individual is willing to allocate, especially in a context of entertainment, primetime television.

Reactions times were generally faster when identifying material that came from educational health storylines than from narrative storylines. At first glance, this may seem counterintuitive. While differences may be due to item difficulty (e.g. certain recog items inherently more difficult than others), early research on the relationship between arousal and performance (e.g. Yerkes and Dodson, 1908) provides an
alternative explanation. Recall the simple inverted U-hypothesis described earlier: when health information was being communicated, viewers may have become overwhelmed and had difficulty encoding the information. Later, when asked to retrieve the information, knowing they “gave up” on the encoding process, participants may have made their selections quickly in order to move on to the next question. Also, the amount of resources necessary to process health information may explain why, in moments of high engagement, participants were more likely to have fast RTs, faster than those associated with recognition of information from periods of low engagement.

Recall of health material was higher than recall of narrative, non-health material in both stimuli. This is encouraging because it suggests that educational content embedded within entertainment television is not “lost” on viewers. Audiences can engage with programming while simultaneously storing key health information.

Despite eliciting greater recall than non-health storylines, particular pieces of information from health storylines were remembered incorrectly. Some of these errors in recall are more problematic than others. For example, participants mis-remembered the name of the gene that indicates an increased risk of breast/ovarian cancer (BRCA1). This type of error is not terribly problematic. In fact, simply knowing that such a gene exists may signify a substantial improvement in awareness. Conversely, there is cause for concern when viewers extract false meaning or make faulty assumptions. This occurred in the HPV condition when nearly one quarter of viewers implied that an HPV diagnosis was synonymous with a cancer diagnosis.
Whereas recall data provided feedback about what type of material was remembered more than others in open-ended fashion, a series of items measured information acquisition, attitudes and behavioral intentions using close-ended questions. Levels of post-exposure knowledge were high and attitudes toward topic-specific preventative behaviors (e.g. early breast cancer detection, transparency of sexual history and status) were generally favorable. While this is good news, it is difficult to draw any conclusions regarding the impact of exposure to health information in the stimuli. As with any non-experimental design, it is impossible to associate positive change, such as high levels of BRCA1 and/or HPV knowledge, with the program itself. With regard to knowledge, however, it is probably safe to say that the items themselves contributed to such high levels (i.e. too simplistic).

When looking at attitude and intention measures there are several areas that show room for improvement. For example, twenty percent of all participants disagreed that condoms are a good method of HPV prevention. Thirty percent had no intention of promoting breast cancer screenings to female friends or family members. There was exceptionally low interest in being tested for the BRCA1 mutation. Additional work, aimed at determining the extent of indecision and/or negative beliefs among the general population or particular sub-groups, could identify potential message topics and targets.

In addition to considering some of the more “common” factors that might explain variation in these cognitive outcomes (e.g. age, race), there is some evidence
here that points to flow as an individual trait that can affect, for example, behavioral intentions. Green’s transportation measure has consistently demonstrated its ability to predict cognitive and behavioral outcomes, more so than NEPS and continuously recorded engagement. Comparatively speaking, the transportation measure is more outcome-oriented, aimed at determining whether or not any given individual experienced flow. Its reflective, self-report format may serve to emphasize the periods of heightened engagement that motivate learning and persuasion. In addition, Green’s transportation scale actually measures multiple components, including emotionality which, in effect, is another predictor of message effectiveness (Nabi, 2002).

Suffice it to say, there is much work to be done with regard to narrative flow and its impact on information processing, learning and persuasion. As discussed early on, and mentioned several times thereafter, the narrative experience is shaped by a confluence of factors. Some of these factors come from within the individual consumer. That is, some people may be more likely than others to achieve flow, period. Some may reach flow faster than others; some may stay in a flow state for longer than others. Apparently, there are also features of the narrative itself that impact flow patterns, both within an individual and across many individuals. Future research should investigate individual characteristics, message characteristics and the interaction between the two in order to better understand narrative flow.
Conclusion

Processing narrative in an audio/visual medium such as television or film, is a complex task. By addressing the ambiguity of process associated with narrative communication, the contributions presented here represent a theoretical and methodological advance over prior work. The proposed model of narrative flow offers a more concrete and direct elucidation of narrative transportation, which is often vaguely defined. Insofar as transportation has been linked with a range of persuasion-based outcomes, this model and its conceptualization of flow may have wide-reaching implications for our understanding of message design and comprehension. It is my hope that researchers will be encouraged to join in efforts to replicate these findings and extend the present research in a range of contexts.
The first episode (A) addresses HPV and its link to cervical cancer. The episode, “Be Patient,” originally aired during season 6 on February 24, 2000 and includes a short vignette about a teenage patient who is diagnosed with cervical cancer and told that the cancer could be related to HPV. In addition, other storylines within the program touch on policy-oriented topics such as the establishment of a free health clinic for low-income patients and institutional cost-containment efforts.

The second episode (B) emphasizes the importance of cancer risk assessment and counseling. The episode, “Man with no name”, which aired during season 12 on October 6, 2005, features a young woman who has family history of breast cancer and previously tested positive for the BRCA1 gene mutation. During the episode, the increased risk of developing breast and ovarian cancer is explained, preventative options are discussed and, ultimately, the young woman decides to undergo a double mastectomy.

The third episode (C) emphasizes the prevalence of hypertension and heart disease among overweight teens. Originally aired during season 10 on May 6, 2004, the episode, “Midnight” features an overweight African-American teenage with poor eating habits. In a prior episode, the teen, admitted to the emergency room for a burn injury, is diagnosed with hypertension and a doctor counsels him to improve his eating habits and exercise more frequently. In this episode, the teen is found to be short of breath and not taking his medication.
### Viewer feedback associated with significant events – additional timelines available upon request

<table>
<thead>
<tr>
<th>Event Description</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>The first few scenes are</td>
<td>12/05-12/21 LOW</td>
</tr>
<tr>
<td>of Liz and Mark waking to work. Mark chats with a coworker who tells him to work. Liz returns to her</td>
<td>12/13-12/25 HIGH</td>
</tr>
<tr>
<td>part of her dress and discovers Mark’s</td>
<td>12/22-12/27 LOW</td>
</tr>
<tr>
<td>dad has been having an affair with her</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>mother.</td>
<td>12/05-12/21 HIGH</td>
</tr>
<tr>
<td>Dr. Kovach has narrowly missed hitting a young girl playing ball in the street. She is struck by a</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>another car, however, and the driver speeds away. During these moments, Dr. Kovach and the</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>girl, her mother outside and they</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>have a focused conversation about</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>the need to get to the hospital. Scars</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>changes to lead and flow and engagement</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>changes again.</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>Scars changes from Liz</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>talking to Mark</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>Helene</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>Koehler tries to help with some</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>changes...maybe moment of</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>cognitive reorientation</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>Engagement level prior</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>hereafter.</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>Dr. Kovach recognizes and approaches the</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>girl and says, &quot;I’m here in the other room too.</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>Scars changes to schoolgirl</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>being rolled in an stretcher. In</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>the aftermath of being diagnosed with HIV, she is</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>overcome.</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>Dr. Kovach can see that the girl’s</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>mother has processed his</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>voice slightly.</td>
<td>12/20-12/22 LOW</td>
</tr>
<tr>
<td>Dr. Kovach asks if the girl</td>
<td>12/20-12/22 HIGH</td>
</tr>
<tr>
<td>has any questions.</td>
<td>12/20-12/22 LOW</td>
</tr>
</tbody>
</table>

**Note:** Additional timelines available upon request.
During this time Dr. Kovatch is at home, his housekeeper chides him for not doing the dishes and asks where Sam is. Dr. Kovatch snaps because they have broken up. This is consistent with my model as it is a period of cognitive dissonance - the viewer lacks context and needs to assess the characters, their relationships to one another. Just before levels increase to within 1 SD of the mean, we hear screams off camera and a man with burns all over his body turns the corner.

Dr. Kovatch is attending to a boy who has fallen off his bicycle and is suffering trauma to the head. There is tension between Dr. Kovatch and Sam, and the boy begins speaking but blood obstructs his airway. Dr. Kovatch declares they must intubate the boy right away. Scares changes to ER, patient with her boyfriend, telling the doctors why they have come to the ER.

Dr. Kovatch is attending to the BRC1 patient. The nurse manager storms through the set of double doors and says he has been irresponsible for not following up on the boy who fell off his bike. Abby calls to the patient, trying to determine if there is any additional health information that can help them determine the cause of her internal blood loss.

After a brief period of engagement levels dropping (as the nurse manager departs the DR), the camera cuts to Abby who informs the BRC1 patient to tell her something about her medical history that she may not have yet. Her vitals are dropping and the staff can't help without this information. The patient reveals she has been going to Mexico for experimental treatments to avoid her insurance going out.

The father of the boy who fell off his bike arrives, and Dr. Kovatch cannot keep him from running straight into the DR. The father watches over his son, who is having trouble breathing, and speaks to his wife sobbing for not watching him better, the father lunging toward her. A nurse calls for security and the scene changes to the nurse manager apologizing to Dr. Kovatch. Levels decrease here.

The nurse manager approaches Sam outside the DR. During these moments of low engagement, she has just told Sam she knows about her relationship with Dr. Kovatch. This storyline was not very well developed in this version. Viewers have little context.

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Appendix C: Items in the proposed Narrative Engagement Processing Scale

Focus dimension
1. I had a hard time keeping my mind on the story. (Busselle & Bilandzic, 2008) (-)

2. I often found myself thinking about other things while reading the story. (adapted from Appel et al., 2002) (-)

3. My attention was focused more on the story than on my surroundings. (Busselle & Bilandzic, 2008)

Cognitive Arousal dimension (ease of cognitive access)
4. It was easy to follow the action and events taking place in the story. (adapted from Appel et al., 2002)

5. I had difficulty making sense of what was going on. (adapted from Busselle & Bilandzic, 2008) (-)

Sympathetic Affect Arousal dimension
6. I could relate to at least one of the characters in this story.

7. I could understand why the character(s) felt the way they felt. (Busselle & Bilandzic, 2008)

8. It was easy to understand why the characters reacted to situations as they did. (Busselle & Bilandzic, 2008)

Empathetic Affect Arousal dimension (transition to loss of self-consciousness)
9. At certain moments in the story, I was feeling the same emotions the character(s) were feeling. (adapted from Cohen, 2001)

10. I could easily imagine myself in the situation of some of the characters. (adapted from Cohen, 2001)

11. I am physically at my computer, but while reading the story I was mentally and emotionally in the world created by the story. (adapted from Kim & Biocca, 1997)

Absorption (Temporal distortion)
12. At times during the story, I completely forgot that I was in the middle of a study.

13. While reading the story, I lost track of time.

(-) reverse code
**Appendix D: Conceptual Trends in Focus, Cognitive Arousal and Absorption Dimensions**

<table>
<thead>
<tr>
<th>Option</th>
<th>My attention was focused more on the story than on my surroundings.</th>
<th>It was easy to follow the action and events taking place in the story.</th>
<th>At times during the story, I completely forgot that I was in the middle of a study.</th>
<th>Option</th>
<th>My attention was focused more on the story than on my surroundings.</th>
<th>It was easy to follow the action and events taking place in the story.</th>
<th>While reading the story, I lost track of time.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>My attention was focused more on the story than on my surroundings.</td>
<td>It was easy to follow the action and events taking place in the story.</td>
<td>At times during the story, I completely forgot that I was in the middle of a study.</td>
<td>B</td>
<td>My attention was focused more on the story than on my surroundings.</td>
<td>It was easy to follow the action and events taking place in the story.</td>
<td>While reading the story, I lost track of time.</td>
</tr>
<tr>
<td></td>
<td>attention 3 Cog Ease 1 Temporal Distortion 1</td>
<td>attention 3 Cog Ease 1 Temporal Distortion 2</td>
<td></td>
<td></td>
<td>attention 3 Cog Ease 1 Temporal Distortion 2</td>
<td>attention 3 Cog Ease 1 Temporal Distortion 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
<td></td>
<td></td>
<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
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<tr>
<td></td>
<td>Pilot Study II 85.11% Pilot Study III 87.36%</td>
<td>Pilot Study II 82.98% Pilot Study III 87.36%</td>
<td></td>
<td></td>
<td>Pilot Study II 86.17% Pilot Study III 93.10%</td>
<td>Pilot Study II 86.17% Pilot Study III 93.10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>attention 3 Cog Ease 2 Temporal Distortion 1</td>
<td>attention 3 Cog Ease 2 Temporal Distortion 2</td>
<td></td>
<td></td>
<td>attention 1 Cog Ease 1 Temporal Distortion 1</td>
<td>attention 1 Cog Ease 1 Temporal Distortion 2</td>
<td></td>
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<tr>
<td></td>
<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
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<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
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</tr>
<tr>
<td></td>
<td>Pilot Study II 86.17% Pilot Study III 91.95%</td>
<td>Pilot Study II 86.17% Pilot Study III 93.10%</td>
<td></td>
<td></td>
<td>Pilot Study II 77.66% Pilot Study III 82.76%</td>
<td>Pilot Study II 82.76% Pilot Study III 82.76%</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>I had a hard time keeping my mind on the story.</td>
<td>It was easy to follow the action and events taking place in the story.</td>
<td>At times during the story, I completely forgot that I was in the middle of a story.</td>
<td>D</td>
<td>I had a hard time keeping my mind on the story.</td>
<td>It was easy to follow the action and events taking place in the story.</td>
<td>While reading the story, I lost track of time.</td>
</tr>
<tr>
<td></td>
<td>attention 1 Cog Ease 1 Temporal Distortion 1</td>
<td>attention 1 Cog Ease 1 Temporal Distortion 1</td>
<td></td>
<td></td>
<td>attention 1 Cog Ease 1 Temporal Distortion 1</td>
<td>attention 1 Cog Ease 1 Temporal Distortion 2</td>
<td></td>
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<tr>
<td></td>
<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
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<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
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<tr>
<td></td>
<td>Pilot Study II 80.85% Pilot Study III 82.76%</td>
<td>Pilot Study II 77.66% Pilot Study III 82.76%</td>
<td></td>
<td></td>
<td>Pilot Study II 79.79% Pilot Study III 86.21%</td>
<td>Pilot Study II 79.79% Pilot Study III 86.21%</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>I had a hard time keeping my mind on the story.</td>
<td>I had difficulty making sense of what was going on.</td>
<td>At times during the story, I completely forgot that I was in the middle of a study.</td>
<td>H</td>
<td>I had a hard time keeping my mind on the story.</td>
<td>I had difficulty making sense of what was going on.</td>
<td>While reading the story, I lost track of time.</td>
</tr>
<tr>
<td></td>
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<td>attention 1 Cog Ease 1 Temporal Distortion 1</td>
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<td>attention 1 Cog Ease 1 Temporal Distortion 1</td>
<td>attention 1 Cog Ease 2 Temporal Distortion 2</td>
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<tr>
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<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
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<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
<td>Percentage with answer patterns consistent with ideal Guttman scale</td>
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<tr>
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<td>Pilot Study II 79.79% Pilot Study III 85.06%</td>
<td>Pilot Study II 79.79% Pilot Study III 86.21%</td>
<td></td>
<td></td>
<td>Pilot Study II 79.79% Pilot Study III 86.21%</td>
<td>Pilot Study II 79.79% Pilot Study III 86.21%</td>
<td></td>
</tr>
</tbody>
</table>
### BRCA Visual Recog Items

<table>
<thead>
<tr>
<th>#</th>
<th>File Name</th>
<th>Flow (position)</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BRCA Foil 1 – Nurse holding back patient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>BRCA Foil 2 – Doctor stiches up rollerdate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BRCA Foil 3 – Nurse manager joins Sam outside</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Boy lying on stretcher</td>
<td>High (during)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Close-up of Abby explaining BRCA</td>
<td></td>
<td>Health</td>
</tr>
<tr>
<td>6</td>
<td>Close-up of burns on stomach</td>
<td></td>
<td>Health</td>
</tr>
<tr>
<td>7</td>
<td>Cigarette Butt in ashtray</td>
<td>Low (just prior)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Nurse curious to learn about BRCA</td>
<td></td>
<td>Health</td>
</tr>
<tr>
<td>9</td>
<td>Dr. Weaver with investors</td>
<td>Low (during)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Abby and BRCA1 patient in room</td>
<td>Low (during)</td>
<td>Health</td>
</tr>
<tr>
<td>11</td>
<td>Father of boy without helmet</td>
<td>High (just prior)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>BRCA1 patient lying on her side</td>
<td>High (during)</td>
<td>Health</td>
</tr>
<tr>
<td>13</td>
<td>Dr. Kovatch’s housekeeper</td>
<td>Low (during)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Dr. Kovatch with burn victim</td>
<td>Low (post)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Nurse manager with Dr. Kovatch</td>
<td>High (post)</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Rollerdate with Dr. Kovatch</td>
<td>High (post)</td>
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### BRCA Segment Audio Recog Items

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<th>Flow (position)</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>BRCA Foil 1 - Aren’t they so cute at that age?</td>
<td>Low (during)</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>BRCA Foil 2 – Thanks Frank. That’ll do.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>BRCA Foil 3 – They said that I still can’t talk to her yet.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>BRCA Foil 4 – I got six more hours. Hey walk with me.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Can you give my friends a tour of the rig?</td>
<td>Low (during)</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Did the oncologist you spoke w/ discuss surgery?</td>
<td>Low (just prior)</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>He really wasn’t up for an interview</td>
<td>Low (post)</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Hemoglobin’s low</td>
<td>High (post)</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>I didn’t know what it would do to my coverage</td>
<td>High (during)</td>
<td>Health</td>
</tr>
<tr>
<td>26</td>
<td>I tested positive for BRCA1 last year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>If you'd like to get formal with me, call me Dr.</td>
<td>High (post)</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Lost a couple of teeth, Robby</td>
<td>High (during)</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Try an 85% chance</td>
<td></td>
<td>Health</td>
</tr>
<tr>
<td>30</td>
<td>What made you get tested?</td>
<td></td>
<td>Health</td>
</tr>
<tr>
<td>31</td>
<td>What did you say your name was again?</td>
<td>Low (just prior)</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>You ever been anemic before?</td>
<td></td>
<td>Health</td>
</tr>
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</table>
**HPV Visual Recog Items**

<table>
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<th>#</th>
<th>File Name</th>
<th>Flow (position)</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HPV Foil 1 – Hemmorhoids patient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>HPV Foil 2 – Dr. Kovatch with surgeon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>HPV Foil 3 - Dr. Kovatch and hit and run mother</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>HPV Foil 4 - Abby removes nose piercing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Abby on phone at nurse's station</td>
<td>Low (post)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Andrea gets results of pap smear</td>
<td></td>
<td>Health</td>
</tr>
<tr>
<td>7</td>
<td>Carol and Dr. Weaver in hallway</td>
<td>Low (during)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Dave locking up his bike</td>
<td>Low (during)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Hit and run driver</td>
<td>High (during)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Dr. Kovatch kneeling in street</td>
<td>High (during)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Dr. Kovatch recognizes driver</td>
<td>High (just prior)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Liz and Mark walk to work</td>
<td>Low (just prior)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Close-up of plumber at wheel</td>
<td>High (during)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Schoolgirls in waiting room</td>
<td>High (post)</td>
<td>Health</td>
</tr>
<tr>
<td>15</td>
<td>Overdose patient wheeled in</td>
<td>High (during)</td>
<td>Health</td>
</tr>
<tr>
<td>16</td>
<td>X-ray technician</td>
<td>Low (just prior)</td>
<td></td>
</tr>
</tbody>
</table>

**HPV Audio Recog Items**

<table>
<thead>
<tr>
<th>#</th>
<th>File Name</th>
<th>Flow (position)</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>HPV Foil 1 – I really just wanted to stop by and thank you.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>HPV Foil 2 – If you waited for the ambulance, she might not have made it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>HPV Foil 3 – You need any more help?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>HPV Foil 4 – You’re not planning to use that thing on me, are you?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Foreign body up the nose and hemorrhoids</td>
<td>Low (post)</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Go ahead, what is it?</td>
<td>High (post)</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Both girls have been going to these sex parties</td>
<td>Low (during)</td>
<td>Health</td>
</tr>
<tr>
<td>24</td>
<td>Cancer, caused by having sex?</td>
<td></td>
<td>Health</td>
</tr>
<tr>
<td>25</td>
<td>This is a public health issue now</td>
<td>Low (post)</td>
<td>Health</td>
</tr>
<tr>
<td>26</td>
<td>Personal path to brain death</td>
<td>Low (during)</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Something wrong back there?</td>
<td>High (during)</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Try to keep your head still</td>
<td>High (during)</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>We also have to inform your partner</td>
<td></td>
<td>Health</td>
</tr>
<tr>
<td>30</td>
<td>While you're at it maybe you can help me out</td>
<td>Low (just prior)</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>What kind of drugs did you take?</td>
<td>High (during)</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>What kind of fish do they catch</td>
<td>Low (just prior)</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>You don't have the right to ask</td>
<td>High (during)</td>
<td></td>
</tr>
<tr>
<td>Item Characteristic</td>
<td># applicable Items</td>
<td>BRCA1</td>
<td>HPV</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------</td>
<td>-------</td>
<td>-----</td>
</tr>
<tr>
<td>Engagement Period</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>High Engagement Moment</td>
<td>9</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Low Engagement Moment</td>
<td>9</td>
<td>11</td>
<td></td>
</tr>
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<td>Structural Feature</td>
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</tr>
<tr>
<td>Audio</td>
<td>9</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5 High, 4 Low)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visual</td>
<td>10</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5 High, 5 Low)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health-storyline</td>
<td>11</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3 High, 2 Low)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5 Visual, 6 Audio)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-health storyline</td>
<td>14</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporal Position to High Engagement Moment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2 Visual, 0 Audio)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1 Visual, 0 Audio)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>During-</td>
<td>4</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2 Visual, 2 Audio)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4 Visual, 4 Audio)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2 Visual, 3 Audio)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1 Visual, 1 Audio)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix F: Questionnaire for Phase III (Main Study)

Participant ID: __________
Condition: BR-HPV / HPV-BR

Pre-viewing instructions:

This study investigates the ways in which people engage with fictional television programs. In a moment, you will be asked to watch two segments, from the popular network medical drama ER. While doing so, please indicate how engaging the events and people in the show are by pressing the right and left arrow keys. By engaging, we mean that the events and people invite you to become mentally and emotionally absorbed in the story. If you think the events and people are engaging, press the key with the right arrow (->). The more engaging you think they are, the quicker you should press the key with the right arrow. If you think the events and people are not engaging, press the key with the left arrow (<-). The more disengaging you think they are, the quicker you should press the left arrow key. Please keep pressing the appropriate arrow keys to indicate your rating throughout the segment as things change.

In order to ensure that you understand and are comfortable with this rating procedure, please watch the following short clips. While doing so, please indicate how engaging the content is.

Play four 30-second PSAs [Rick Series, Grandpa’s Casket, Smelly Puking Habit and Urge Suspense]

I’m going to ask about images that might have occurred in the ads you just saw. For each image, answer ‘Yes’ if the ad you saw had the image, ‘No’ if the ad did not have the image.

Randomized recognition items (12 in total – 3 are actual stills from two of the PSAs and 6 are foils from PSAs not viewed).

Great. Before moving on to the first segment, I’m going to ask you to count backward from the number [RANDOM 3-digit number to be INSERTED] for 20 seconds. Press “Begin” when you are ready to start counting. [timer goes for 20 seconds and then next screen appears]. You will now watch the first segment, from the popular medical drama ER. Please remember to provide continuous feedback, using the right and left arrow keys, regarding how engaging you think the clip’s material is.
Post-viewing instructions:

Please answer the following questions by selecting from the choices provided.

If BRCA1 insert knowledge, attitude, behavioral intention items here.

Have you ever heard of the BRCA gene (pronounced ‘braca’ or ‘B-R-C-A’)?
Yes No

The BRCA1 gene increases a person’s risk of breast and ovarian cancer by 85%
True False

BRCA1 is a genetic mutation that indicates an increased risk of breast and ovarian cancer
True False

Prophylactic surgery involves having one’s breast(s) removed. It decreases one’s chances of getting breast cancer by 50%
True False

On a scale from 1 to 5, where 1=strongly disagree and 5=strong agree, how much do you agree with each statement when thinking about breast cancer?

It is important to detect breast cancer early

Having a mastectomy (surgery to remove the breast) is a good option for preventing breast cancer

If someone is diagnosed with cancer, he or she should get a second opinion.

On a scale from 1 to 5, where 1=very unlikely and 5=very likely, how likely are you to do the following within the next 12 months?

(1) Get a mammogram
(2) Get a breast exam at my doctor’s office
(3) Recommend a breast cancer screening (mammogram or breast exam at doctor’s office) to a woman I know
(4) Get tested for the BRCA gene mutation

**If HPV insert knowledge, attitude, behavioral intention items here.**

Human papilloma virus (HPV) can cause cancer.

- True
- False

Most people infected with human papilloma virus (HPV) do not realize they are infected or that they are passing the virus to a sex partner.

- True
- False

To diagnose human papilloma virus, one must have a pelvic exam and pap smear.

- True
- False

*On a scale from 1 to 5, where 1=strongly disagree and 5=strong agree, how much do you agree with each statement when thinking about HPV?*

- Condoms are a good method of protecting oneself from contracting human papilloma virus (HPV)
- Individuals should be aware of their partner’s sexual history before having sex with him/her
- If someone has been diagnosed with HPV, he or she should notify all past and future partners.

*On a scale from 1 to 5, where 1=very unlikely and 5=very likely, how likely are you to do the following within the next 12 months?*

1. Seek out information about human papilloma virus;
2. Use contraception during sexual activity
3. Consider a preventative HPV vaccine for myself and/or recommend a preventative HPV vaccine to a young woman I know.
Based on the ER clip you just watched, please rate your agreement with the following statements:

[randomize the first 11 items]

1. While I was watching the episode, I could easily picture the events in it taking place.
   
   1 2 3 4 5 6 7
   Strongly Disagree Nor Agree Neither Agree Nor Disagree Strongly Agree

2. While I was watching the episode, activity going on in the room around me was on my mind.
   
   1 2 3 4 5 6 7
   Strongly Disagree Nor Agree Neither Agree Nor Disagree Strongly Agree

3. I could picture myself in the scene of the events depicted in the show.
   
   1 2 3 4 5 6 7
   Strongly Disagree Nor Agree Neither Agree Nor Disagree Strongly Agree

4. I was mentally involved in the episode while watching it.
   
   1 2 3 4 5 6 7
   Strongly Disagree Nor Agree Neither Agree Nor Disagree Strongly Agree

5. After the episode ended, I found it easy to put it out of my mind.
   
   1 2 3 4 5 6 7
   Strongly Disagree Nor Agree Neither Agree Nor Disagree Strongly Agree
6. I wanted the story to continue.

7. The story affected me emotionally.

8. I found myself thinking of ways the story could have turned out differently.

9. I found my mind wandering while watching the episode.

10. The events in the story are relevant to my everyday life.

11. The events in the story have changed my life.

12. I had a hard time keeping my mind on the show.
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree
13. I often found myself thinking about other things while watching the show.
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree

14. My attention was focused more on the show than on my surroundings.
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree

15. It was easy to follow the action and events taking place in the show.
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree

16. I had difficulty making sense of what was going on.
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree

17. I could relate to at least one of the characters in this show.
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree

18. I could understand why the character(s) felt the way they felt.
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree

19. It was easy to understand why the characters reacted to situations as they did.
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree
20. At certain moments in the show, I was feeling the same emotions the character(s) were feeling.
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree

21. I could easily imagine myself in the situation of some of the characters
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree

22. I am physically at this computer, but while watching the episode I was mentally and emotionally in the world created by the show.
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree

23. At times during the episode, I completely forgot that I was in the middle of a study.
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree

24. While watching the show, I lost track of time.
   a. Strongly agree
   b. Agree
   c. Disagree
   d. Strongly disagree

[New page - Free response – let’s have no limit on characters]. *Tell me about the episode you just watched. Provide as much detail as possible.*
Next, I’m going to ask about images that might have occurred in the ER you just saw. For each image, answer ‘Yes’ if the ad you saw had the image, ‘No’ if the ad did not have the image.

Image/audio recognition items. (There are a total of 65 items – 15 of these are foils.) Yes/No answer choice format and embedded timer on each screen.

Prior to today, have you seen this episode of ER before? (please circle one)

No       Yes

Approximately how long ago did you see the episode? (please circle one)

Within the past month
Within the past 6 months
Within the past 12 months
Over 12 months ago

If HPV:
Which of the following describes your personal experiences with cervical cancer?
(Check all that apply)
O a. I have been diagnosed with cervical cancer.
O b. A family member or someone close to me has been diagnosed with cervical cancer.
O c. I have been diagnosed with cancer (any type).
O d. A family member or someone close to me has been diagnosed with cancer (any type).
O e. I work on these issues through my job or volunteer work.
O f. None of the above

-OR-

If BRCA1:
Which of the following describes your personal experiences with breast cancer?
(Check all that apply)
O a. I have been diagnosed with breast cancer.
- b. A family member or someone close to me has been diagnosed with breast cancer.
- c. I have been diagnosed with cancer (any type).
- d. A family member or someone close to me has been diagnosed with breast cancer (any type).
- e. I work on these issues through my job or volunteer work.
- f. None of the above

Please get ready to rate the next program.

As a reminder, while viewing the clip, please indicate how engaging the events and people in the show are by pressing the right and left arrow keys. By engaging, we mean that the events and people invite you to become mentally and emotionally absorbed in the story. If you think the events and people are engaging, press the key with the right arrow (>). The more engaging you think they are, the quicker you should press the key with the right arrow. If you think the events and people are not engaging, press the key with the left arrow (<). The more disengaging you think they are, the quicker you should press the left arrow key. Please keep pressing the appropriate arrow keys to indicate your rating throughout the segment as things change.

Play Clip #2  <<Condition to be previously assigned >>>

Post-viewing instructions:
Repeat from above

[New page]

Final Post-viewing instructions

You’re almost done! Now you will be asked some demographic and questions related to your media use. Please indicate only one answer for each question.

Are you Hispanic/Latino(a) (such as Mexican, Puerto Rican, or some other Spanish background)?

0  1
No Yes
Which of the following groups best describes your racial background?
1 2 3 4 5 6 7
White or Black or African Asian American Indian Native Hawaiian More than one race Other
Caucasian American or Alaska Native or other Pacific Islander

What is your highest level of education completed?
1. Some high school or less
2. Completed high school
3. Some college/trade school
4. College graduate
5. Graduate school
88. Decline to answer

What is your approximate household income?
1. Less than $25,000
2. $25,000 - $49,999
3. $50,000 - $74,999
4. $75,000 - $99,999
5. $100,000 or more
88. Decline to answer

What is your age group?
1 2 3 4
18-20 yrs 21-24 yrs 25-29 yrs 30 to 35 yrs

During a typical weekday (for example, Tuesday or Wednesday), how much time do you spend watching television in minutes? 1 hour = 60 minutes. (For example, for one and a half hours, enter 90 minutes. If you watch less than an hour, for instance, a half hour, you should write 30 minutes).

__________ minutes

8. During a typical weekend day (for example, Saturday or Sunday), how much time do you spend watching television in minutes? 1 hour = 60 minutes. (For example, for one and a half hours, enter 90 minutes. If you watch less than an hour, for instance, a half hour, you should write 30 minutes).

__________ minutes
[I think this was multiple pages on our previous study – anyway to fit all on one?]

How often do you watch new episodes of the following shows?

<table>
<thead>
<tr>
<th>Show</th>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Often</th>
<th>Always</th>
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<tbody>
<tr>
<td>a. ER</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>(when it was on-air)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. House</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>c. Scrubs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>d. Private Practice</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>e. Grey's Anatomy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>f. Mercy</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Thank you for your responses.
Appendix G: List of recall items for Phase III (Main Study)

HPV: Participant ID ________________

From "Low" Periods:
Liz and Mark talk while on their way to work/walking in snow/talk about ice fishing
0=absent, 1=present, 99=present but inaccurate
Dr. Maluci rides his bike to work/passes them on his bike
0=absent, 1=present, 99=present but inaccurate
Liz has forgotten her notes for a case/patient at her apartment
0=absent, 1=present, 99=present but inaccurate
Mark chides her jokingly for sleeping at his place
0=absent, 1=present, 99=present but inaccurate
Liz kisses Mark goodbye
0=absent, 1=present, 99=present but inaccurate
Mark talks to Dr. Maluci about locking his bike up properly
0=absent, 1=present, 99=present but inaccurate
Dr. Maluci thanks "mom"/wonders whether he'll be chided for not wearing a helmet
0=absent, 1=present, 99=present but inaccurate
Mark tells Dr. Maluci he would never get between him and his "personal path to brain death"
0=absent, 1=present, 99=present but inaccurate
Elizabeth returns home to get her forgotten papers
0=absent, 1=present, 99=present but inaccurate
Her mother is having breakfast/is still in her bathrobe.
0=absent, 1=present, 99=present but inaccurate
Liz asks if her mother was watching Charlie Rose again
0=absent, 1=present, 99=present but inaccurate
Her mother responds "not exactly"
0=absent, 1=present, 99=present but inaccurate
Mark's father appears wearing his boxers and slippers
0=absent, 1=present, 99=present but inaccurate
Liz looks surprised/shocked/disgusted (not + emotion)
0=absent, 1=present, 99=present but inaccurate
Liz notices that the slippers Mark's father is wearing are her own
0=absent, 1=present, 99=present but inaccurate
Mark jokes with Xray Technician about how busy things are/they bicker over who has more work
0=absent, 1=present, 99=present but inaccurate
Mark looks at his dad's xray
Based on Mark's expression, we can assume the xray does not look good
0=absent, 1=present, 99=present but inaccurate

Just Prior to High Engagement:
A car tries to illegally pass Dr. Kovatch/Luca
0=absent, 1=present, 99=present but inaccurate
After hitting a young girl, the hit and run driver speeds away.
0=absent, 1=present, 99=present but inaccurate
Dr. Kovatch gets a look at the hit and run driver/makes eye contact
0=absent, 1=present, 99=present but inaccurate
Dr. Kovatch/Luca runs to the girl in the street and tells her things will be "Okay."
0=absent, 1=present, 99=present but inaccurate
Little girl cries out/says "it hurts"
0=absent, 1=present, 99=present but inaccurate
Dr. Kovatch/Luca tells the young girl's mother that he is afraid the girl might be bleeding internally.
0=absent, 1=present, 99=present but inaccurate
Dr. Kovatch/Luca confronts/yells at/tells the hit and run driver that he saw him leave the scene of the accident and that he can identify him
0=absent, 1=present, 99=present but inaccurate
The hit and run driver admits that it was an accident; he panicked and drove away.
0=absent, 1=present, 99=present but inaccurate

During High Engagement:
Dr. Kovatch/Luca asks the young girl what part of her body hurts, after being struck by a hit and run; the girl replies that it is her leg.
0=absent, 1=present, 99=present but inaccurate
Dr. Kovatch/Luca instructs the young girl not to move/to remain still.
The young girl is lying on street surrounded by her mother, her playmate and onlookers.
The ambulance is taking too long so Dr. Kovatch/Luca asks a plumber if he can transport the girl [to the hospital].
On the way to the hospital, the young girl has a tension pneumothorax/ a collapsed lung.
While putting a needle into the young girl’s chest, to relieve the pressure, the van jostles/hits a bump and Dr. Kovatch/Luca
knocks an artery.

Dr. Kovatch/Luca calls ahead to the hospital/ER
The hit and run driver admits that the reason he left the accident was because he was scared; he has several DUIs already.

The hit and run driver had not been drinking that day.
The hit and run driver asks how the little girl is doing and the doctor tells him he does not have the right to ask.
Andrea/HPV patient/schoolgirl is brought in after overdosing on pills
She had taken the drugs approximately one hour before arriving.
Carol/Nurse confirms that the patient/girl was in earlier that day, newly diagnosed with cervical cancer
The girl’s stomach needs to be pumped.

Post High Engagement:
Two schoolgirls ask Carol/Nurse to ensure that their conversation will be confidential/that their concerns will not be repeated to their parents
The school girls are concerned that syphilis/an STD is spreading through their school.

The doctor says “OK, follow me.”
Liz and Mark/Two doctors talk about the affair their parents are having; Mark finds it funny though Liz does not.
A doctor tells the hit and run girl’s mother that the little girl came out of surgery and is doing well/The little girl will “make it”

Non-health Storyline:
Mark’s father visits Liz in the ER and apologizes for possibly offending her that morning.
Liz and Mark’s father discuss the relationship between Liz and her mother.
Andrea reminds Carol that she can’t tell her parents - anyway, they are in Europe.

Andrea and her friend leave the ER
Dr. Kovatch tells Abby to have the surgeon page him
Dr. Kovatch is running out to get something to eat
Hit and run driver is getting his head stitched up
Dr. Kovatch tells abby to call the police/security
Hit and run driver overhears Dr Kovatch call for police and tries to get away a second time
Hit and run girl’s mother thanks Kovatch and the surgeon/black doctor
Andrea’s friend rushes into the ER

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50=absent, 1=present, 99=present but inaccurate
She tells the doctors that there were prescription drugs/Diazapram in her father's medicine cabinet 0=absent, 1=present, 99=present but inaccurate

Andrea wakes up/will be okay 0=absent, 1=present, 99=present but inaccurate

Friend says "What did you do?" 0=absent, 1=present, 99=present but inaccurate

X Ray technician, after seeing Mark's reaction to his dad's xray comforts Mark, says he's sorry 0=absent, 1=present, 99=present but inaccurate

Health Storyline:

Carol asks to speak with Andrea privately/splits up the schoolgirls 0=absent, 1=present, 99=present but inaccurate

Carol tells Andrea there were abnormal cells in her pap smear/her test results were abnormal 0=absent, 1=present, 99=present but inaccurate

Andrea may have cervical cancer 0=absent, 1=present, 99=present but inaccurate

The doctors/ER will have to do a biopsy to make sure whether Andrea's HPV is cancerous 0=absent, 1=present, 99=present but inaccurate

HPV stands for humanpapilloma virus 0=absent, 1=present, 99=present but inaccurate

Not everyone with HPV has cervical cancer 0=absent, 1=present, 99=present but inaccurate

Carol wants to have Andrea admitted to the hospital 0=absent, 1=present, 99=present but inaccurate

If Andrea is not treated she could get very sick 0=absent, 1=present, 99=present but inaccurate

Andrea should inform her partner 0=absent, 1=present, 99=present but inaccurate

Andrea does not know how many sexual partners she has had/who "gave" her HPV 0=absent, 1=present, 99=present but inaccurate

The schoolgirls have been attending sex parties 0=absent, 1=present, 99=present but inaccurate

This is a public health issue 0=absent, 1=present, 99=present but inaccurate

All the other girls at the sex parties should come in for pelvic exams/pap smears/to get tested 0=absent, 1=present, 99=present but inaccurate

How many NON-CONTENT related thoughts are there?

Opinions about show, characters; disclosure of personal experience or ability to relate/emote
BRCA: Participant ID

**From "Low" Periods:**
Kovatch fell asleep with television/Western on; cigarette in ashtray still burning
Housekeeper arrives - it is the 1st Thursday of the month when she always comes
Dr. Kovatch tells housekeeper she can go home
Housekeeper objects because Samantha says...Samantha doesn't live here anymore; she has apparently moved out/broken up
Housekeeper brings him his mail
Housekeeper tells Kovatch to do the dishes; otherwise he'll get bugs/cookaracha
Dr. Weaver is giving tour to two "suits"
Dr. Weaver spots Kovatch arriving and asks Tony to give them tour of the rig
Dr. Weaver scolds Kovatch for being 40 minutes late/there is no attending on the floor
Nurse manager approaches Sam outside the ER
Kovatch tells Sam to tell Alex he will pick him up and take him to the soccer game.
Kovatch crosses the street and Sam looks after him

**Just Prior to High Engagement:**
Boy was not wearing helmet; promises Luca/The attending/Doctor he will in the future
Boy lost a couple of teeth
Boy was making gurgling sounds due to blood blocking his nasal pharynx
Boy asks for his mom
Nurse manager storms through OR doors
Dr. Kovatch/Doctor/Luca is needed in the other OR to attend to the boy because he is a more experienced physician
The boy is hypoxic
Abby/Nurse asks BRCA1 patient if there is anything else she can think of that the doctors should know
BRCA1 patient reveals she has been going to Mexico for alternative treatments
Boy's father screams at Luca/Doctor and says his boy is not dead
Boy's father breaks away from Luca/Doctor and searches rooms for his son

**During High Engagement:**
There is tension between Luca/Doctor and Sam/Nurse; they disagree on how to treat the boy, whether to intubate or not
The nurse manager offers to "float in" an extra nurse
BRCA1 patient was on a rollerdate
0=absent, 1=present, 99=present but inaccurate

BRCA1 patient got dizzy and fainted/fell/hit boy on bike
0=absent, 1=present, 99=present but inaccurate

Nurse manager asks for the difficult airways box
0=absent, 1=present, 99=present but inaccurate

There is tension between Dr. Kovatch and nurse manager
0=absent, 1=present, 99=present but inaccurate

BRCA1 patient has been on 3 day juice fast, herbal anemas and natural medicine to boost immune
0=absent, 1=present, 99=present but inaccurate

Nurse/Abby diagnoses BRCA1 patient with lead poisoning
0=absent, 1=present, 99=present but inaccurate

BRCA1 patient says she hesitated to say anything [about treatments] because she was scared what it would do to her insurance/coverage.
0=absent, 1=present, 99=present but inaccurate

Luca/Doctor meets boy’s father.
0=absent, 1=present, 99=present but inaccurate

There is swelling in the boy’s brain
0=absent, 1=present, 99=present but inaccurate

Luca/Doctor tells the boy’s father that they had to put an emergency airway in his neck
0=absent, 1=present, 99=present but inaccurate

Boy’s mother sobs an apology to the boy’s father
0=absent, 1=present, 99=present but inaccurate

Boy’s father lunges at/attacks the boy’s mother
0=absent, 1=present, 99=present but inaccurate

Assistant/nurse calls for security
0=absent, 1=present, 99=present but inaccurate

Post High Engagement:
The roller-date couple/BRCA1 patient left their shoes and arrive in rollerskates
0=absent, 1=present, 99=present but inaccurate

Abby/Nurse/Doctors/Luca review patients medical history to determine cause [of fainting]
0=absent, 1=present, 99=present but inaccurate

BRCA1 patient is not on any medications, just vitamins
0=absent, 1=present, 99=present but inaccurate

BRCA1 patient did not eat breakfast
0=absent, 1=present, 99=present but inaccurate

BRCA1 patient’s hemoglobin levels are low
0=absent, 1=present, 99=present but inaccurate

BRCA1 patients shirt is cut away to reveal burns on her stomach
0=absent, 1=present, 99=present but inaccurate

Luca/Doctor refers to nurse manager as Mrs. and she corrects him to say Dr.
0=absent, 1=present, 99=present but inaccurate

Boy’s father demands to see his son
0=absent, 1=present, 99=present but inaccurate

Boy’s father blames wife [for giving his son the bike]
0=absent, 1=present, 99=present but inaccurate

Boy’s father says his wife makes him out to be the bad guy, spoiling the boy rotten
0=absent, 1=present, 99=present but inaccurate

Nurse manager apologizes to Dr. Kovatch/Luca and says she will focus on determining how the nurses should be utilized.
0=absent, 1=present, 99=present but inaccurate

Non-health Storyline:
Screams are heard off camera, mother snatches up little girl to get out of the way
0=absent, 1=present, 99=present but inaccurate

Burn victim turns corner, flailing his arms and in pain
0=absent, 1=present, 99=present but inaccurate

Security offers asks if they got a name for the burn victim; nurse responds
0=absent, 1=present, 99=present but inaccurate

Kovatch and Sam are in the Rx closet; he gives her mail
0=absent, 1=present, 99=present but inaccurate

Sam asks if Kovatch will still take Alex to his soccer game
0=absent, 1=present, 99=present but inaccurate
Alex would really enjoy it; yes Kovatch will take him
Kovatch would like Sam to reconsider; she says they were just pretending
Abby interrupts Kovatch and Sam in the Rx closet
Kovatch punches the wall before leaving the Rx closet
Kovatch and Sam are the only two doctors left to work together on Robby
Mr. Trim Body slipped on puddle of jello during performance
Intern checks his spleen but mistakes his liver
Neela points out Trim Body is missing genitalia
Camera zooms in on missing genitalia
Abby wheels the BRCA1 patient into a private room
Kovatch approaches Sam outside of the ER; makes sure she has a ride home
(Additional) Health Storyline:
Female patient tested positive for BRCA1 gene
BRCA1 indicates an 85% increased chance of getting breast/ovarian
Abby offers to have an oncologist come down; get a second opinion
BRCA1 says she was tested on account of her mother
Her mother had cancer and passed away just before her senior prom/she was 44 years old
Abby asks if oncologist told her about preventative measures (mastectomy, hysterectomy)
BRCA1 patient says she'd never do that
She is young and wants to have a family; man would never fall in love with her
There have been advances in reconstructive surgery in recent years
Mastectomy decreases odd of getting cancer by 90%
Patient asks Abby which poison to pick

How many NON-CONTENT related thoughts are there?
Opinions about show, characters; disclosure of personal experience or ability to relate/emote
How many of these NON-CONTENT thoughts are about HEALTH storyline?
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