We Interrupt This Story:
Examining the Effects of Interruptions on Processing of Online News

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A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the School of Journalism and Mass Communication.

Chapel Hill
2010

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ABSTRACT

JESSICA E. SMITH: We Interrupt This Story: Examining the Effects of Interruptions on Processing of Online News
(Under the direction of Sriram Kalyanaraman)

Computer users online encounter a variety of alerts, confirmation notices, and advertisements that have the potential to interrupt users in pursuit of their goals online. This dissertation examines cognitive and affective effects of interruptions, and it attempts to add to the existing body of literature on interruptions by varying the complexity of interruptions, timing of interruptions, and complexity of the primary task — which is reading online news stories. The current studies operationalized interruptions as pop-up advertisements that users had to contend with while trying to read news stories on a news Web site.

Memory and attitude toward interruptions, stories, and Web site were measured in two studies. The first was a 2x3 between-subjects design that manipulated structural complexity of the interruption (simple and complex) and interruption timing (beginning, middle, and end) ($N = 106$). The experiment showed no main effects of structural complexity of an interruption or interruption timing on memory for interruptions, memory for stories, time spent on site, attitude toward interruptions, or attitude toward the Web site. However, participants' memory for interruptions decreased for complex interruptions that occurred later and increased for simple interruptions that interruptions occurred later.

The second study was a 2 (structural complexity of the interruption — simple or complex) x 3 (interruption timing — beginning, middle, or end) x 2 (story complexity — simple or complex) between-subjects design ($N = 214$). There were no main effects of structural complexity of an interruption or interruption timing on memory for interruptions, memory for stories, time spent on site, attitude toward interruptions, or attitude toward the Web site. Story complexity also exerted no main effects except for the amount of time spent on the Web site. However, when participants encountered simple interruptions, memory decreased for later interruptions in short stories. Conversely, memory increased for later interruptions in long stories. In addition, when participants encountered complex interruptions, memory increased as users encountered interruptions occurred later in short stories. In long stories, participants' memory scores were lower when interrupted in the middle than at the beginning or end.

Theoretical and practical implications, limitations, and suggestions for future research are discussed.

ACKNOWLEDGEMENTS

Sri Kalyanaraman encouraged me to think theoretically and ask conceptual questions, and I thank him for serving as my adviser. My committee members, Francesca Dillman Carpentier, Rhonda Gibson, Melanie Green, and Gary Marchionini, made wonderful contributions to this dissertation. I am indebted to them for their marks on my scholarship.

The generosity of the Park family and Triad Foundation enabled my doctoral work at UNC, and I am grateful for their support. Many friends and colleagues helped to recruit the participants for this dissertation, and I am so thankful for their assistance.

Friends from Texas, Florida, and North Carolina provided plenty of perspective and love throughout this process. Jonathan Smith kept things real, and Lindsey Smith made me laugh. My parents, Charles and Deanne Smith, took first-day-of-school pictures on hot August mornings for the first 13 years, and they cheered me through the next 10 years. They taught me to love learning and to just do my best. Thanks.

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CHAPTER ONE
INTRODUCTION AND THEORY

People live in a world saturated with media and information, and the Internet contributes a large portion of that information. Increasingly speedy connections make it possible for consumers to access large amounts of information quickly. Consequently, individuals can easily search, surf, and select information from the Web to meet their needs and interests. Current metrics support the impressive magnitude of this diffusion: about three quarters of people online have used the Web to access news, and nearly 40% do so on a typical day to follow stories that can be continually updated (Horrigan, 2008). As people spend more and more time online, they often experience one of the same issues they have typically encountered in human-human interaction: interruptions. People start and stop tasks all day as phones ring, colleagues ask questions, and timers sound. Now interruptions have become an inevitable part of human-computer interaction (HCI), as well as life in the offline world. Interruptions can take many forms, but at its most basic level, an interruption is an event that reduces an individual's focus on a primary task.

Computers divert attention by alerting users about software updates, low battery power, new e-mail messages, scheduled appointments, or any number of other matters. These "attention diverters"—interruptions—extend to Web use, as users may be drawn away from their browser use by notices of suspicious downloads, a request to confirm desired site language, or never-ending advertisements. In the current Web environment, users must strive to navigate seemingly endless content while also contending with

interruptions, and these might include pop-up browser windows carrying advertisements, survey invitations, or additional content. The effects of such interruptions, which have been shown to annoy users (Bailey, Konstan, & Carlis, 2001; Diao & Sundar, 2004), may be compounded by characteristics of the interruptions themselves or the underlying primary content. These effects lead to questions about information processing of the primary task — such as reading news online — while being forced to deal with the interruption.

The sophistication of the current technological landscape is reflected in the fact that Web sites choose to allow users to be interrupted, and some do not interrupt or seek to do so only in certain ways. For instance, several Web browsers allow users to choose to block the most ubiquitous online interruptions (the pop-up advertisement). However, newer techniques place before users interruptions that are increasingly complex and can be carefully timed; these interruptions may move around the screen and cannot be blocked by browsers. These developments occur at the same time that news providers are seeking ways to build audiences online (Palser, 2008; Project for Excellence in Journalism, 2008). With news sites already offering a variety of multimedia resources to draw user attention, the demands on users' cognitive resources are further increased because users also have to negotiate with interruptions of varying complexity and timing.

Conceptually, such processing demands can affect user responses toward both the primary task (e.g., reading news online) and the interruption itself (e.g., a pop-up ad). These responses have been shown to be both cognitive, such as memory for the story, and affective, such as attitude toward the interruption (see Diao & Sundar, 2004; Kalyanaraman, in press; Xia & Sudharshan, 2002). The goal of this dissertation is to

extend the scope of these findings by examining the effects of variables that have gained prominence in online environments but have not received the same empirical attention. Web programmers know that Web users are easily annoyed by interruptions when they are online (Bailey et al., 2001; Diao & Sundar; Kalyanaraman, in press), so interruptions have become increasingly sly and novel. Users may see pop-up advertisements that appear to be floating because they are not enclosed in a traditional browser window, and these advertisements can skate around most browsers' pop-up blockers. These interruptions may be programmed to move around the screen in a predetermined pattern or even to jump to a new screen location if the user's mouse touches the pop-up window. These are just a few examples of what may be called structural complexity of an interruption. The term "structural complexity" is used throughout this dissertation to indicate that users must deal with more than the content of the window; they must deal with the behavior of the interruption itself (Bucy, Lang, Potter, & Grabe, 1999; Reeves & Nass, 1996).

In addition to the options for varying structural complexity, programmers can dictate exactly when users should be interrupted. For example, users could be interrupted 30 seconds after navigating to a page, or once they scroll past a certain location on the page, or when they navigate away from the page. The timing of interruptions has the potential to affect the way users process the content of the primary task, as well as the interruption. Even if the structural complexity and timing of an interruption are identical on multiple Web pages, the experience of the interruption may be different for users on each of those pages. The complexity of the primary task on each Web page can vary, which may change the amount of effort users put into those tasks. Not all primary tasks in

the same category — such as the category "reading a news story" — are created equal. The amount of information that individuals must process in each story is different, varying the complexity.

This dissertation focused on the effect of three variables on the way participants processed the content of news stories and interruptions they encountered while reading the stories. The variables are structural complexity of the interruption, interruption timing, and complexity of the primary task. In addition to advancing knowledge about the psychological relevance of these variables, the dissertation attempted to uncover the mechanisms underlying these effects, particularly in a situation that is ubiquitous but has rarely been examined in the interruptions context.

These studies examined the effects of interruptions on processing of online news. Specifically, users dealt with pop-up advertisements while trying to read news stories on a news Web site. The two studies in this dissertation varied the structural complexity of the interruption, the timing of the interruption, and the length of the story. Dependent variables included participants' memory for the interruptions and story content, as well as their attitudes toward the interruption, story, and Web site. This dissertation will proceed by defining and reviewing the concept of interruptions and examining the relationship of interruptions to message processing and attitudes. The hypotheses, methods, results, and discussion of Study 1 precede the hypotheses, methods, results, and discussion of Study 2. Concluding remarks discuss the overall findings of the studies, limitations, and directions for future research.

Literature Review

Interruptions

Scholars in several disciplines have examined interruptions in both the offline and online worlds, and their work aids in defining interruptions and considering their characteristics. Their work helps to form the foundation for expectations in the present two studies.

Defining interruptions

An interruption typically commands attention as a one-time event that shifts attention from a primary task to a secondary one and then back. Interruptions were studied as early as the 1920s when Zeigarnik stopped people during some simple tasks and allowed them to complete others (Zeigarnik, 1955). She found that people were more likely later to remember the tasks during which they were interrupted. Other researchers found that fatigue, time spent on tasks, task success versus failure, task pleasantness versus unpleasantness, and participants' attitudes affected responses to interruptions (Butterfield, 1964; Nowlis, 1941; Prentice, 1944).

Coraggio (1990) defined interruption for knowledge workers as "an externally-generated *[sic]*, randomly occurring, discrete event that breaks continuity of cognitive focus on a primary task" (p. 19). This definition of interruptions requires action by something other than the user. For instance, Coraggio's stipulation that an interruption must be externally generated would mean that a Web user who clicked on a hyperlink and then went back to the original page had not been interrupted because the break in continuity was internally generated. A flickering animation that repeats itself over and over in a feature or advertisement at the periphery of a user's vision would not be

considered a discrete event because the user may encounter the animation throughout a visit to a Web page.

Others also emphasized elements of Coraggio's (1990) definition. Discontinuity of a primary task was a key factor for Rennecker and Godwin (2005), and Xia and Sudharshan (2002) emphasized that whether an interruption was caused by person, machine, or event, it was out of the control of the interrupted individual. McFarlane (1998) shaped much of the early work on interruptions in HCI but still worked from a broad definition of interruption: "Human interruption is the process of coordinating abrupt change in people's activities," which may be in one of three areas of human operation: cognitive, perceptive, or physical (p. 119). More specifically for HCI, McFarlane defined interruption as "the process of coordinating task switching in the human activity of multitasking" (p. 124). His taxonomy of human interruption included four methods of interruption. Immediate interruptions, such as a demand for a password in order to continue downloading files, require a response at once by users. Negotiated interruptions allow users to decide when to respond, and many e-mail programs on computer desktops provide this kind of interruption. An incoming message causes a tone to sound or notification to appear, but the user can ignore this alert until a convenient time to check the new message. Mediated interruptions add an agent to the user interface that decides when to present the interruption. Users of older versions of Microsoft Word might remember Clippy, the animated paperclip that offered suggestions and help files when users seemed to struggle with a task, and computer game players are familiar with avatars that make suggestions at strategic points of the game. The final type of interruptions, scheduled interruptions, come at certain times or intervals. Many

computers are set to remind users to back up data or shut down the machine each evening; some computer games will ask users if they want to take a break after they have played for a predetermined amount of time. These scheduled interruptions may be related in some ways to interruptions on Web sites that are tied to users' behavior on the site. The length of time a user visits a Web page can trigger an interruption.

Both Coraggio's and McFarlane's definitions focus on the random, disruptive nature of making a person switch tasks. This is particularly true of online interruptions that computer users face. Many Web sites offer users little control in how they use the sites. In such a case, users who try to access information on the site in a different order than the site creators intended may be interrupted during their search for content. They also may have to deal with advertisements in their way (Xia & Sudharshan, 2002). Interruptions function by overloading users' attention (Xia & Sudharshan, 2002). The definition of interruptions in this study draws on the work of Coraggio (1990) and McFarlane (1998), as well as other work previously mentioned. For this study, an interruption is an event that reduces a user's focus on a primary task.

Factors affecting information processing of interruptions

Interruptions have been shown to have negative effects on amount of time to complete a task, error rate, decision making, and affective state (Bailey & Iqbal, 2008). This study focuses on complexity and timing of interruptions as independent variables, and these variables have been included in previous studies of interruptions. Research about interruption relevance affected the operationalization of this study, so that also is reviewed here.

Relevance. Users want the content they consume online to be relevant to their needs and interests, and relevant content leads to positive perceptions of Web sites (Kalyanaraman & Sundar, 2006). Studies have shown different effects for relevant and irrelevant interruptions. Xia and Sudharshan (2002) suggested that relevant interruptions could be used to help users with decision tasks. Relevant interruptions led to less time on the primary task than when computer users faced an irrelevant interruption (Cutrell, Czerwinski, & Horvitz, 2000). In addition to allowing users to complete their work more quickly, relevant interruptions have been shown to be less irritating than irrelevant interruptions (Edwards, Li, & Lee, 2002). Irritation builds from a sense of intrusiveness, and people perceive highly relevant information to be less intrusive when it interrupts them, according to Edwards, Li, and Lee (2002). The researchers said reactance theory suggested that people would resist anything they perceived as limiting their freedom.

Relevant interruptions were far more successful than irrelevant interruptions in attracting attention, eliciting positive attitudes, and increasing perceptions of interactivity, according to Kalyanaraman (in press). Kalyanaraman and Ivory (2009) also found that relevant advertisements elicited more positive attitudes than did irrelevant advertisements. Studies have consistently found that people have greater memory for and more positive attitudes toward relevant materials, such as advertisements and pop-up advertisements, than they do for irrelevant materials. Therefore, this dissertation will not vary the relevance of interruptions and will use relevant interruptions in all cases.

Complexity. The traditional approach to varying complexity has considered the amount or magnitude of the information that people encounter. It is helpful to examine findings from this traditional use of the variable before considering other approaches to

varying complexity. Complex or difficult tasks occupy more cognitive capacity and also require "more 'pending' operations in working memory" than simpler tasks (Coraggio, 1990, p. 45). On the whole, Coraggio (1990) found that interruptions degrade performance on complex tasks. He proposed considering a task's granularity to determine its complexity. A granular task would have a high number of natural subtasks, such as questions on a test or steps to problem-solving, or perhaps a Web search that required computer users to visit many sites briefly. Participants didn't feel the effects of an interruption as strongly when it occurred between subtasks when they were naturally changing gears from one topic or task to the next. Granularity may be but one characteristic of task complexity, but it is useful. Reading a news article has few subtasks and may be considered low in granularity. Interruptions during tasks with low granularity risk adding enough information to push people to cognitive overload, but a person with a task high in granularity may be bored and may welcome the interruption (Coraggio, 1990). Although people have initial breaks in workload between subtasks when the overall task is granular, workload does not decrease between subtasks that occur late in the task (Bailey & Iqbal, 2008). This suggests that cognitive load is higher at the end of a task, and people may face greater cognitive cost when interrupted near the end of a task.

Tasks also may be classified in a typology of task complexity developed by Campbell (1988), who argued that task complexity is directly related to attributes that increase information load, diversity, or rate of change. Therefore, many complex tasks lack structure and are ambiguous and difficult. Complexity is primarily a psychological experience, an interaction between task and person, and a function of objective task characteristics in this work. The task complexity scheme includes four attributes:

- Multiple ways to an end state,
- Multiple end states,
- Conflicting relationships among ways to multiple outcomes, and
- Uncertain or probabilistic linkages among outcomes.

Coraggio (1990) suggested that the conflict among ways to multiple outcomes always makes knowledge work complex. In the present studies where participants read news stories, complexity may be considered a judgment task, according to Campbell's typology. Judgment tasks have conflicting interdependence and/or uncertain or probabilistic linkages, and they have no multiple end states or multiple ways to arrive there. Judgment tasks require people to determine to which pieces of information they will attend, weight the selected information appropriately, and combine the information to make a judgment. This kind of synthesis occurs when people read.

Interruptions during two types of complex tasks impaired decision-making abilities in people, and participants who had symbolic tasks took much longer to complete the complex tasks when they were interrupted (Speier, 1996). Time on task was not affected for complex spatial tasks, but this appeared to be because participants did not complete the interruption tasks properly in order to keep their speed up. Speier concluded that the findings were consistent with the Yerkes-Dodson law, which holds that performance on a task is an inverted U-shaped function of arousal (Kahneman, 1973). For instance, an arousing stimulus would improve a person's performance on a simple task but hurt performance on a complex task. People have to work harder on complex tasks, and Kahneman pointed out that this involves several factors: "Tasks at different

levels of complexity elicit different degrees of arousal and demand different amounts of attention and effort" (p. 17).

Defining complexity by the amount of information that users have to process could be called content complexity. In this scenario, the amount or difficulty of information in the body of a message varies the level of complexity that users face. This type of content complexity is the approach used in the present studies to vary the complexity of the primary task. A simple story has less information for users to process than a complex story does. But the content of a message does not provide the only information that users must process in an online environment. For example, a designer who produces an advertisement to be printed in a newspaper or magazine has several choices: include more text or less, include a picture or not, or print the advertisement in color or black and white. However, a designer of an online advertisement has many more choices because the Internet is a richer medium than print. Not only does the designer have to make choices about the color and text and pictorial content, but the designer may choose to embed the advertisement in a page or have it pop up. Internet advertisements can include animation, links to other resources, or other interactive elements. Pop-up advertisements can move around the screen, either on a pre-determined path or in response to a user's actions.

Options such as these create another type of complexity, which may be called structural complexity. The distinction between content and form on the Web has been explored carefully (Bucy, Lang, Potter, & Grabe, 1999; Reeves & Nass, 1996). Bucy et al. noted that content includes the verbal and visual information of a message, whereas form includes the structural elements of a page. In addition, formal features had the

power to compel attention and increase memory in Web site users, and the appeal of a site "depends on the way information is packaged" (p. 1247). The authors also pointed out that study and manipulation of formal features is often an afterthought. As new media have emerged as subjects of interest in mass communication research, scholars often first focus on the medium, its users, and its content, and only later address the effects of technological aspects and developments of the medium (Wimmer & Dominick, 2006). One of the formal features of a window within a Web browser is the behavior of the window itself. Shneiderman and Plaisant (2010) said that short-term memory load increases when the Web browser window is hidden for a time — and such is the case when a pop-up window obscures the main window of interest. Studies that differentiated between content and structural elements of Web material found that structural variables can affect users' attention and memory, both separately from the content of the messages and in interaction with it (Grabe, Lang, & Zhao, 2003; Lang, Borse, Wise, & David, 2002).

Complexity is an important variable in studies of HCI because of the reciprocal nature of influence necessary for true interaction (Pavlik, 1998). Complexity can easily affect the understanding and level of responsiveness that each party is able to bring. The variable-centered approach would suggest that complexity may be varied in order to understand concepts like interactivity and HCI more clearly. In order to do this fully, researchers must examine various aspects of complexity — both content and structural complexity. Varying the structural complexity of interruptions will provide more information about the way people process information in rich media.

Timing of interruption. Resumption lags are shorter when events interrupt at strategic points during the primary task. As participants programmed a VCR-like application on a computer, an interruption required them to stop that task and shadow a moving point on the screen with their cursor (Monk, Boehm-Davis, & Trafton, 2002). Resumption lags were shorter when interruptions occurred before a task began or during a repetitive task, such as scrolling through a list. Interruptions in the middle or at the end of tasks resulted in longer resumption lags. Interruptions early in a task were more likely to require participants to ask for reminders of their primary task in another study (Cutrell, Czerwinski, & Horvitz, 2001), though. Participants searched a list of titles for particular books and occasionally were interrupted by an instant messaging window asking them to complete a simple math problem. An interruption in the first quarter of the trial made participants significantly more likely to ask for a reminder of their current search task. Overall, participants were slower to find titles after interruptions. Bailey et al. (2001) found that people who were interrupted at a point in their task that had a high memory load had a more difficult time switching back to the primary task.

Several studies have supported the finding that interruptions are most harmful in the middle of a task compared to the beginning (Coraggio, 1990; Speier, 1996). Coraggio also implicated the concept of granularity. When interruptions occurred between small subtasks of a larger task, participants were at a natural transition point. Their performance on the primary task was not hurt as much by interruptions during these gaps. It is worthwhile to consider whether the concept holds true for interruptions occurring between individual Web pages because task variables such as complexity may affect whether an interruption is viewed positively or negatively.

Czerwinski, Cutrell, and Horvitz (2000) showed that interruptions early in a task had less cost to participants timewise. Their study used a Web search stimulus that had planning, execution, and evaluation phases. Again, interrupted tasks were completed more slowly than uninterrupted tasks. Responses were quickest when participants were interrupted during the planning stage, or when they were formulating a search string. Interruptions during execution, which was the phase when participants were typing or using menus, or evaluation, which was the phase when they were selecting the best result out of the ones returned, resulted in reliably slower responses. The researchers replicated the findings with the execution state in another study (Cutrell et al., 2000).

Participants were no more likely to feel positive toward early interruptions than late ones, but late interruptions did cause participants to spend more time on task than earlier interruptions (Xia & Sudharshan, 2002). Participants had an online shopping task, and interruptions consisted of information about other products in the category they were shopping. Researchers hypothesized that early decisions would be processed more easily and that late interruptions would cause uncertainty in users' almost-formed decisions. The expected pattern of results appeared, but researchers concluded that participants perceived the interruptions as adding an extra burden to their decision processes. Xia and Sudharshan said this suggested that "interruptions may not be a good format to present information that is related to the decision task" (p. 276). The timing of an interruption may change the effect of its disruption on the user. Studies have shown that people get back to their primary tasks more quickly when interruptions occur at the beginning rather than the middle or end of a task (Czerwinski et al., 2000; Monk et al., 2002; Xia & Sudharshan, 2002).

Users also are affected by the number of interruptions they face in a given time. Monk (2004) found that people were able to resume primary tasks more quickly when they were interrupted more frequently. People seem to habituate to interruptions after they cope with several of them. Participants were interrupted every 10 seconds or 30 seconds while programming a VCR, and resumption lag was about half a second less for participants in the frequent interruption condition than those in the infrequent interruption condition. The interruption task was not cognitively demanding, so Monk speculated that participants rehearsed or improved their goal management. In a similar vein, Xia and Sudharshan (2002) suggested that computer users became proficient in working around interruptions, such as pop-up ads, and had coping mechanisms for the glut of information they encountered. In addition, users became frustrated as they faced attentional overload. These studies of effects of frequency of interruption do not directly address the issue of interruption timing, but they suggest that many people may already have established patterns of responses to online interruptions, such as pop-up ads.

In general, it seems that interruptions in the middle or end of a task are most harmful for task performance, but there is little evidence of how the timing of an interruption affects attitude toward the interruption or task. Reading a story is not a task with many subtasks, so the work to complete the task will be cumulative. Pop-up advertisements can occur at any time an individual is at a Web page, so interruptions at the beginning, middle, and end are entirely feasible.

Summary of independent variables

Previous research suggests that relevance, complexity, and timing of interruptions affect people when they encounter interruptions. Differential effects of relevant and

irrelevant interruptions have been consistently demonstrated (Diao & Sundar, 2004; Edwards et al., 2002; Kalyanaraman, in press; Kalyanaraman & Ivory, in press), so this dissertation will not seek to replicate these results by including relevance as an independent variable. All interruptions in the proposed studies will be relevant to the news content participants are reading. Independent variables in these studies will include timing of interruptions, structural complexity of interruptions, and complexity of primary task (in this case, news stories). Each of these variables may affect cognitive and affective processing of the stimuli, so the relationships of interruptions, message processing, and affective responses must be examined.

Effects of interruptions

The earlier discussion of interruption timing and complexity suggested that interruptions evoke both cognitive and affective responses. This section reviews several conceptual and theoretical frameworks that suggest how the specific independent variables — structural complexity of interruptions, timing of interruptions, and complexity of primary task — affect the primary dependent variables in these studies. This dissertation will examine both cognitive and affective effects, so dependent variables include memory and attitudes.

Information-processing theory suggests that people process information through various systems (Eysenck, 1993) that draw from the same pool of resources and have finite, limited capacity (Broadbent, 1958). Information is perceived and sent to sensory stores, and attention transfers some of the information to short-term stores (Atkinson & Shiffrin, 1968). Selection processes will move some of the information in short-term stores, where it has been retained by rehearsal, to long-term stores (Atkinson & Shiffrin,

1968). Cognitive processing is commonly divided into three subprocesses: encoding, storage, and retrieval (Lang, 2000; Nelson, 1985; Zechmeister & Nyberg, 1982). The subprocesses occur simultaneously and continuously, so cognitive processing is most thorough when people have enough cognitive resources available to apply to a task and choose to apply resources fully (Lang, 2000).

Memory

Memory is organized into nodes (Collins & Quillian, 1969), and the memory storage process involves linking bits of information with other related pieces of information in memory. The more associative links a piece of information has, the more accessible and thoroughly stored it is (Lang, 2000). This approach is an important part of a study of interruptions because an interruption can add to the amount of information to process at one time. The level of complexity of stimuli or their timing may affect processing, which can be shown through various memory measures that demonstrate the thoroughness of each subprocess.

One of the dependent variables in this dissertation is memory, which is often discussed as if it were a unidimensional measure. However, cognitive processing is not one simple step in the mind, so measures for memory vary depending on the underlying subprocess of interest. A researcher interested in investigating the amount and level of encoding that occurred for a stimulus should use recognition measures, which index encoding. Cued recall tasks index the storage process of any particular piece of information, and free recall tasks indicate how well an individual can retrieve certain pieces of information (Lang, 2000). All of these may be considered memory measures, but they are not interchangeable. Recognition and recall are dissociable, and they "are not

stand-ins for some more global concept of memory" (Bradley, 2007, p. 230). This dissertation will employ both measures of recognition and recall to have a more thorough measure of participants' memory for the information they see.

Recognition. Recognition measures the extent of the encoding process (Lang, 2000), and distinctive pieces of information, or ones that are easy to distinguish among at encoding, tend to fare well in recognition memory (Childers, Heckler, & Houston, 1986). At least three ways exist to measure recognition memory. The first is forced-choice tasks, in which individuals see two or more pieces of information and must choose which one appeared in the target stimulus previously. Information may appear in pairs with the target and a foil or as multiple-choice questions, a popular form of forced-choice tasks. Absolute judgment tasks require individuals to look at a piece of information independent of any others and judge whether it was part of the stimulus (Shapiro, 1994; Zechmeister & Nyberg, 1982). True/false or yes/no questions are common absolute judgment tasks. The final type of recognition task is limited in its application. Continuous recognition tasks require individuals to read through stimulus material and determine whether they have seen a particular word or item previously in that stimulus (Zechmeister & Nyberg, 1982).

Recall. Recall is often categorized as one type of memory, but two different cognitive subprocesses can be measured with different types of recall tasks. Cued recall measures how thoroughly a particular piece of information was stored, and it is a moderately sensitive measure of memory. Free recall measures how accessible a particular piece of information is for retrieval, and it is the least sensitive measure of memory. Sensitivity is not a measure of utility or superiority but simply indicates the

level of specificity of a measure. A lack of specificity may sometimes be desirable if a researcher wants to see the most accessible information after an individual's exposure to a stimulus (Shapiro, 1994).

A study by Diao and Sundar (2004) examined memory for Web site advertisements. The results indicated that people shifted to searching long-term memory when they encountered pop-up ads, but people found representations of the banner ads in short-term memory. Animation didn't affect memory for either type of ad in that study, and although people later recognized products advertised in banner ads better, they had higher recall for the content in pop-up ads. Users also recognize site content better when it uses in-line ads rather than pop-up ads (McCoy, Everard, Galletta, & Polak, 2004). Bailey et al. (2001) found that people who were interrupted at a point in their task that had a high memory load had a more difficult time switching back to the primary task. Kalyanaraman (in press) found no difference between memory for pop-up advertisements and pop-unders, which appear as browser windows underneath the main window and are only visible when the computer user closes the main window. Also, memory for advertisements relevant to the stories that participants read was no higher than for irrelevant advertisements. However, an interaction effect revealed that relevant advertisements that interrupted users (in the form of pop-ups) were remembered better than relevant advertisements that did not interrupt users (in the form of pop-unders).

Information-processing approach

The traditional associative learning approach, in which a stimulus yielded a response, suggested that interference in information processing caused people to forget information (Zechmeister & Nyberg, 1982). In contrast, Broadbent (1958) advanced the

information-processing approach by defining people as multi-system processors. He suggested that people sent sensory input to a preattentive sensory store called the *S* system, which was a short-term or "buffer store" (Broadbent, 1971, p. 135). The information then was filtered and arrived at a limited-capacity store, known as the *P* system. Broadbent made three assumptions about the memory systems. First, primary and secondary memory were separate systems; second, primary memory had a limited capacity; and third, primary memory held information only to the extent that a person rehearsed it. If rehearsal is necessary to retain memory of information, then a pop-up ad that computer users often condition themselves to ignore might not be recognized or recalled well. When information input increases, any particular piece of information in the *S* system has less of a chance of being filtered into the *P* system.

Broadbent (1971) concluded that no matter how well people think they shut out irrelevant messages, though, interruptions and distractions do make it through the filters between the *S* and *P* systems. He also found that the intrusion of relevant distractions was even more probable than irrelevant streams of information. This suggests that people should have some memory for interruptions, and they should have even greater memory for relevant interruptions than irrelevant interruptions. Broadbent's theory did not allow for parallel processing of simultaneous stimuli after the filter, though. It generally is not useful in determining what people are incapable of, even though it provides a good approximation of what people usually actually do (Kahneman, 1973).

Limited capacity model of motivated mediated message processing

The model uses the encoding, storage, and retrieval subprocesses (Lang, 2000) and assumes that they occur simultaneously during media consumption (Lang, 2007).

LC4MP makes five assumptions, the first being that people have a finite capacity for the information they can process at one time. The model also assumes that people are motivated by two innate systems: the appetitive system, which fuels curiosity and the desire to approach stimuli, and the aversive system, which provides fear and avoidance reactions. The third assumption is that media present stimuli in multiple channels, such as sight and sound, and formats, which are modalities, including print and video. The fourth assumption is that human behavior constantly changes, and the fifth is that communication occurs through the information processing system of people and the communication message (Lang, 2007).

The assumption about the appetitive and aversive systems is important because neutral environments make the appetitive system more active than the aversive system. This gives a positivity offset in such circumstances that gives people the greatest opportunity for information intake in safe environments. For example, many people might be curious about a new computer system or program and would begin a tentative exploration when they had opportunities. Once the aversive system activates, though, it gains strength very quickly. This negativity bias pushes people out of harm's way. So a message that asked users to confirm they wanted to delete all files in a folder might startle users and scare away ones who were afraid they would "break" the computer irreparably. For a computer novice, a warning is often likely to be enough to active aversive reactions to the program or system. Unless the program or system offered such a user irresistible benefits, the user is likely to continue to avoid the computer. This example demonstrates the principle that a stimulus must be very positive to earn a high appetitive activation but must be only moderately bad to draw the same level of aversive

activation. When the aversive system is active, the retrieval subprocess draws the most resources because the danger is already encoded, and the mind also stores information that will help the person deal with similar situations in the future (Lang, 2007).

If people have limits on their processing capabilities, then the possibility for overload exists when too much information awaits encoding, storage, and retrieval. The simultaneous action of these subprocesses means that heavy demands on one will take away the resources available to the others. If, for instance, a person sees something in a commercial that reminds him of a past experience, his mind may divert resources to retrieval of the memory, which leaves fewer resources available to encode and store the continuing commercial stimulus. Or if a picture is filled with many bright colors and vivid images, initial processing might draw resources away from storage and retrieval capabilities. Therefore, people may not fully process messages if they choose not to commit the amount of resources a stimulus requires or if the message requires more resources than people have available (Lang, 2000).

People can choose some of the things they pay attention to, but the mind also has automatic attention responses. One of these is the orienting response, which occurs for novel stimuli or signal stimuli, which are things that naturally catch attention, such as a person's name or an indication that important information is soon to be available (Lang, 2007). The packaging of a message affects orienting responses (Grabe et al., 2003). Grabe et al. found that sensationalizing a news message through tabloid packaging does not lead to better recall or less accurate memory. Although the "bells and whistles of tabloid packaging" (p. 407) increase the resources allocated to processing the message, the additional stimuli that the packaging imposes on top of the content can lead to

cognitive overload. This suggests that the complexity of stimuli increases cognitive load. Complex primary tasks and complex interruptions also should have higher cognitive load, which can harm processing and reduce recognition and recall.

People have finite resources available to encode, store, and retrieve information that they encounter (Bettman, 1979). Computer users who visit a Web site to read a news story will expend some of their resources by taking in the words and photos that make up the story. Then they will read the story and perhaps mentally retrieve information they've just read in order to give context to a later bit of information. They also must pay attention to how to navigate the site and negotiate information from advertisements. Things such as pop-up ads can serve as interruptions, and the complexity and relevance of those interruptions may affect processing of the interruption itself and primary content. Complex interruptions should require more resources to process than simple interruptions because they provide more features or information to which users must attend. The higher cognitive load for complex interruptions should increase the amount of resources allocated to the encoding subprocess, which takes away from resources for storage (Lang, 2007). LC4MP suggests that users should have better memory for simple interruptions than complex interruptions.

H1a: Users will recognize and recall simple interruptions better than complex interruptions.

Cognitive operations

Kahneman, Treisman, and Gibbs (1992) suggested that people have specific object files in their minds, and they use episodic representations of those objects when they encounter them. Each stimulus is a separate object with its own file, and new stimuli

are named more quickly if they are physical matches to a previous stimulus in the same perceptual object. Even when people focus on one attribute of an object, they can't prevent a "perceptual interpretation of other dimensions" (Kahneman, 1973, p. 111). These object-based theories of visual attention suggest that objects' status determines how the mind allocates attention among the objects (Diao & Sundar, 2004). Therefore, an object that appears suddenly, such as a pop-up window, will immediately demand a representation and therefore will receive visual attention. The demand for attention will split attention from the primary task (Kalyanaraman, in press).

Split-attention effect

Research into the split-attention effect drew from cognitive-load theory (Sweller, Chandler, Tierney, & Cooper, 1990; Tindall-Ford, Chandler, & Sweller, 1997). Cognitive load theory suggests that certain problem-solving strategies have heavy cognitive demands, which reduces the amount of resources available for learning (Sweller et al., 1990). It assumes a limited working memory and relatively unlimited long-term memory. Under these conditions, "the split attention effect occurs when people attend to multiple sources of information that must be mentally integrated before meaning can be derived" (Tindall-Ford et al., 1997, p. 259). Kalyanaraman (in press) suggested that when computer users encountered a pop-up interruption on a Web site, they would have increased memory for the interruption because of the split attention forced by the interruption. The split-attention effect may be particularly applicable to relevant interruptions. Although the interruption and Web site are separate information sources, users would have to perform some processing to establish the link between them. This rationale would suggest that relevant interruptions cause greater cognitive load.

However, since research has suggested that close proximity reduces the cognitive load that split-attention organization causes (Tindall-Ford et al., 1997), a browser window that pops up in front of another one may be physically near enough to ameliorate this potential effect. In addition, Kahneman (1973) suggested that people exerted more effort when facing greater demands on their cognitive resources. Under a "more is better" perspective, it could be argued that the presence of more information to process increases the amount of information participants will remember, particularly when stimuli are arousing (Kahneman, 1973). This line of reasoning suggests a competing hypothesis as an alternative to *H1a*.

H1b: Participants will recognize and recall complex interruptions better than simple interruptions.

If an interruption appears before people have invested many resources in the primary task, then the resumption lag is brief, and total time spent on task, minus time spent on the interruption, is low. Interruptions in the middle of a task occur when people have expended resources and are actively trying to complete the remaining portion of the primary task. They must reorient from one task to another and back. Interruptions at the end of a primary task have been shown to cause uncertainty in a consumer decision-making task (Xia & Sudharshan, 2002), but an interruption at the end may have few ill effects in a pure information task. If users have already absorbed the information they are going to from the primary stimulus, an interruption at the end is simply the next place to direct attention because users do not have to shift back to the primary task.

H2: Interruptions in the middle of a story will lead to worse recognition and recall for both the interruption and the story compared to interruptions at the beginning or end.

H3: Interruptions in the middle of a story will lead to more time spent on the primary task compared to interruptions at the beginning or end.

Attitude toward interruptions

Affective reactions are perhaps the most gut-level responses to attitude objects, and they have been measured reliably even in the absence of recognition memory for the objects (Zajonc, 1980). Zajonc argued that affect and cognition were under separate control, and that even though they interacted in a variety of ways, each affected information processing differentially. As Coraggio (1990) demonstrated, computer users can have a positive attitude toward an interruption if they are ready for a break, even if the interruption has cognitive costs. The dissociation between memory and attitudes make them interesting dependent variables for these studies. Interruptions, primary tasks, and the Web site providing the stories and interruptions are likely to have distinct responses indicating participants' attitudes toward these objects.

Interruptions are often seen as intrusive, which causes people to feel irritated and then avoid the interruptions (Edwards et al., 2002). Kalyanaraman (in press) suggested that people may show psychological reactance against interruptions, so they may reject the content of the interruption in addition to their general annoyance. When people encounter an advertisement in a separate window while browsing the Internet, they seem to have negative attitudes about the interruption, not the advertisement itself; Kalyanaraman showed that participants had more positive attitudes toward pop-under

advertisements than pop-up ads. Coping with the interruption increases the amount of work that computer users must perform, which may increase the reactance. A complex interruption requires even more work than a simple interruption, so complexity may affect participants' attitudes toward interruptions.

H4: Users will have more negative attitudes toward complex interruptions than simple interruptions.

It is clear that interruptions annoy users (Bailey et al., 2001; Diao & Sundar, 2004; Kalyanaraman, in press), and some evidence suggests that people do not have more positive attitudes toward interruptions that occur early in a task compared to interruptions that occur later (Xia & Sudharshan, 2002). However, late interruptions cause people to spend more time on task, and people are able to get back to the primary tasks more quickly for early interruptions than later ones (Czerwinski et al., 2000; Monk et al., 2002; Xia & Sudharshan, 2002). If people perceive interruptions as needless disruptions that cause them to spend more time than necessary on a task, it is likely that their attitudes toward the interruption will be increasingly negative.

H5: Users will have more negative attitudes toward late interruptions than earlier ones.

Attitude toward the Web site

This study also allows the researcher to examine the objects of participants' positive or negative feelings. If participants are annoyed by an interruption (Edwards et al., 2002), they could blame the interruption itself. Participants also could assign responsibility for the interruption to the Web site that features both the news story and the interruption they encountered. This possibility has been supported by several studies. Xia

and Sudharshan (2002) showed that interruptions reduce computer users' satisfaction with the process and experience of their task. As with the interruptions themselves, people had more negative attitudes toward the Web site they were exploring when they encountered pop-up advertisements compared to pop-under ads (Kalyanaraman, in press). As the sense of intrusion increases, negative affect is likely to grow. A complex interruption, which requires the user's effort to track it around the screen before it can be closed, seems like it would create a greater sense of intrusion.

H6: Users will have more negative attitudes toward the Web site for complex interruptions than they will for simple interruptions.

Just as the timing of interruptions may affect users' attitudes toward the interruptions themselves, the timing also may affect attitudes toward the Web site. Users are likely to see an interruption as an intrusion (Edwards et al., 2002), and users may blame the Web site for allowing the interruption to be part of the user experience (see Kalyanaraman, in press). Since later interruptions require users to spend more time overall on the task (Czerwinski et al., 2000; Monk et al., 2002; Xia & Sudharshan, 2002), users are unlikely to be happy about coping with a late interruption.

H7: Users will have more negative attitudes toward the Web site for late interruptions than for earlier ones.

The variables of interruption complexity and timing should not only act alone on processing of online news but interact, as well. Complex tasks require greater cognitive capacity (Coraggio, 1990), so people must dedicate more mental resources to these tasks. People do not merely apply cognitive resources to a task once but continue the effort throughout the task, and cognitive load can grow as more information must be processed.

Bailey and Iqbal (2008) found that breaks between parts of an overall primary task did not decrease cognitive workload when the breaks occurred late in the task. This suggests that cognitive load is high at the end of many tasks. People who are interrupted at a point in a task that carries a high memory load have a difficult time switching back to the primary task (Bailey et al., 2001). In an online consumer decision task, people felt more uncertain about their decisions when they were interrupted late in the task; Xia and Sudharshan (2002) said the interruptions were perceived as an extra burden on the decision process.

The previous studies suggest that cognitive effort is high as people near the end of tasks, and people who are interrupted then may not be able to focus as intently on the task again to draw conclusions and make final linkages among the pieces of information presented. Interruptions late in the task should decrease memory for the content of the story users are reading, and this effect should be exacerbated by the amount of information that users are processing. A complex interruption would require even more processing at a time when users are already processing a great deal of information.

H8: Users will have better memory for story content when they encounter simple interruptions that occur late in the task than for complex interruptions that occur late.

In addition, users are likely to resent the intrusion of the interruption (Edwards et al., 2002) more when they perceive it to be an additional burden (Xia & Sudharshan, 2002). This sense of intrusion is likely to increase as structural complexity increases. Complex interruptions do not wait passively to be closed; participants must work harder to close the interruption as it moves across the screen than they do with a simple, stationary interruption. As sense of intrusion increases, negative affect is likely to

increase. A complex interruption may seem even more jarring when users are trying to focus on finishing the story, and users may react more negatively to complex interruptions occurring late in their task.

H9: Users will have more negative attitudes toward complex interruptions that occur late in the task than toward simple interruptions that occur late.

A summary of hypotheses and findings is available in Table 1.

CHAPTER TWO

STUDY ONE

This study used a 2x3 mixed measures design to manipulate the structural complexity of an interruption and its timing. Interruptions in this study were pop-up advertisements that appeared while participants were reading news stories on a Web site. The content of the advertisements was the same for all participants, but structurally complex interruptions appeared in moving browser windows, and structurally simple interruptions appeared in stationary browser windows. The timing of the interruption was varied by having the pop-up window appear at the beginning, midpoint, or end of each story. Participants read three news stories on a Web site and were exposed to a pop-up advertisement during each story. The stories appeared to be from an online news service, Focus News, which was created in order to avoid participants' biases about existing news providers. After reading the stories, participants responded to an online questionnaire measuring their memory and attitudes toward the stimuli, and then they were debriefed and thanked.

Method

Participants

Participants were 124 undergraduate students enrolled in courses in the Department of Journalism and Mass Communication at Abilene Christian University. The participants were 67.9% female with a mean age of 20.50 years.

Stimulus materials

Pre-test. Stimuli for the experiment were pre-tested on 18 students (77.8% female). Participants read four stories and saw a pop-up advertisement with each. The first story reported a study that examined gender differences in math skills of students in the United States, and the accompanying pop-up advertised a Texas Instruments calculator. The second story reported a trend of increasing obesity in the United States, and the accompanying pop-up advertised the weight-loss drug Alli. The third story reported about individuals and businesses that have dropped landline phone service and the options on the Web and in cell phone service that are replacing traditional phones. The pop-up window with the phone story advertised a Sprint cell phone. The fourth story discussed the drop in holiday online sales but the overall growth of Internet commerce, and the accompanying pop-up featured the online-only retailer Overstock.com. Each story was 600 words long. Participants responded to an online questionnaire (see Appendix A) after reading all stories and reported their interest and levels of familiarity and involvement in each of the stories, as well as their familiarity with the brands in the advertisements. They also rated each advertisement on its level of relevance to its respective story (see Table 2) on a seven-point scale (1="Irrelevant," 7="Relevant").

Table 2. Stimulus pre-test results

Story/ Advertisement	**Interest in story***	**Ad's relevance to story***
Gender and math/Texas Instruments	4.28 (1.07)	4.50 (1.65)
Obesity/Alli	4.72 (1.36)	5.28 (0.96)
Landline phones/Sprint	4.22 (1.39)	5.83 (1.20)
E-commerce/ Overstock.com	4.0 (1.28)	5.22 (1.73)

* Cell values are means and (standard deviation) on a scale where 1=least and 7=greatest.

The primary purpose of this pre-test was to ensure that participants saw a high degree of relevance between each story and advertisement they saw so that the level of relevance would be consistent among stories. The stimuli chosen for the experiment (see Appendix B) had the highest mean relevance between the story and advertisement; all were above 5 on a 7-point scale. These three stories were also moderately interesting to the pre-test participants; they were between 4 and 5 on the 7-point scale.

Stimulus design. The three stories selected for the study were placed on Web pages with a logo for Focus News and a navigation bar for the site. The links in the navigation bar were disabled but were on the pages to give the site a legitimate appearance. At the end of each story, a small logo with the word "next" and an arrow linked to the next story.

The first independent variable, structural complexity of the interruption, varied the amount of tracking required to close the pop-up window. A simple interruption was an advertisement that popped up in a separate, stationary browser window. For participants in the complex interruption condition, the identical advertisement also popped up in a separate window, but it floated diagonally across the screen for several seconds before stopping, and then participants could catch and close it.

The other independent variable in this study was the timing of the interruption, and participants were assigned to one of three conditions. An interruption at the beginning was a pop-up window that loaded simultaneously with the Web page containing the target story; an interruption in the middle popped up as participants scrolled to the physical, spatial midpoint of the target story; an interruption at the end occurred as participants touched the cursor arrow to the link from the target story to the

next Web page. Participants could not immediately close the moving advertisements, and a lack of control over an interruption has been shown to increase the perception that the interruption is intrusive (Edwards et al., 2002). Participants had to process the content of the advertisement while the window was moving, and this additional tracking element was intended to increase the cognitive load of the interruption.

The timing of the interruption was controlled by Javascript written into the HTML code of each story's Web page. For interruptions at the beginning of a story, the script instructed the pop-up ad to appear when the body text of the story loaded on the page. For interruptions at the end of a story, the script instructed the pop-up ad to appear when the participant's mouse hovered over the link to the next story, which would indicate that the participant was finished with the story and about to click for the next one. A timer ensured that the pop-up window appeared only once and not every time the participant hovered over the "Next" button. For interruptions in the middle of a story, the script constantly polled the participant's physical location on the page. The pop-up window appeared when participants scrolled into a 200-pixel-tall ribbon of space that had been pre-measured as the vertical center of the page for that story. The appearance of the pop-up window deactivated the script, ensuring that participants would see the advertisement only once while visiting the page, even if they scrolled up and down.

Participants were randomly assigned to one of six conditions. To prevent recency or primacy effects in the responses to the questionnaire, the order in which stories were presented was counterbalanced in each condition. A link on the page after the third story directed participants to a questionnaire (see Appendix C) posted online using the survey tool Qualtrics.

Dependent variables

Memory. The questionnaire evaluated participants' memory about the stories and interruptions using a combination of multiple-choice and fill-in-the-blank questions in order to measure both recognition and recall of facts from the stimuli. Participants answered two recognition questions about each story, and these questions included:

- *Online sales from the Monday after Thanksgiving increased how much over the last year? 1%, 5%, 15%, or 30%*
- *Current guidelines (from 2005) recommend how many minutes of exercise each day? 10-20, 30-45, 60-90, or 90-120*

Two questions designed to measure recall were also presented for each story, and participants had to type their responses into a blank field after each question. These questions included:

- *What phone company says landline phone subscriptions are falling 8% to 9% each year?*
- *Each person has a genetically determined weight range spanning about how many pounds?*

Twelve questions measured memory for story content, and an additional six questions evaluated memory for content of the interruptions. Participants answered one question about brand recall for each interruption (e.g., *What was the name of the cell phone company advertised in a pop-up ad?*) and one multiple-choice question about each interruption to evaluate recognition of the advertisement's content (e.g., *According to the Sprint pop-up ad, unlimited texting with Sprint cost how much monthly? $5, $7, $10, or $13*). In total, participants responded to 18 questions about memory for the stories and

advertisements to which they were exposed. Each correct response was counted as one point, and participants could receive up to 12 points about story content, up to 6 points about advertising content, and 18 points overall. These responses were treated together as indices of memory for content.

Attitude. Attitude toward each pop-up interruption that appeared during the browsing experience was measured using a 14-item semantic differential scale (Ivory & Kalyanaraman, 2007; Kalyanaraman, in press). Participants rated a number of dimensions of the advertisement they saw using anchors such as "Appealing/Unappealing," "Boring/Interesting," and "Ordinary/Sophisticated." Some items were reverse coded (see Appendix C for full questionnaire). These scales were highly reliable. For the scale about the interruption with the advertisement for Overstock.com, Cronbach's $\alpha = .88$. The Sprint advertisement had Cronbach's $\alpha = .92$, and the Alli advertisement had Cronbach's $\alpha = .94$. When the scales for all three advertisements were merged, overall reliability of the scale for attitude toward interruptions was Cronbach's $\alpha = .93$.

In order to ensure that the scale was not measuring multiple concepts, a principal components analysis was performed for each advertisement and the combined measurement for the three advertisements together. The analyses used the principal axis factoring technique with an oblique rotation. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was high for each advertisement and did not improve by breaking the scale into two or more factors. Further, the suggestions for potential factors were not consistent across the advertisements; the same items did not always load onto the same factors. For the Overstock.com advertisement, KMO = .84; for the Sprint advertisement,

KMO = .87; and for the Alli advertisement, KMO = .92. The KMO for all advertisements considered together was .90.

Since the scales were reliable for each advertisement and for the advertisements together, responses to the 14 questions for each advertisement were averaged together. Participants selected numbers between 1 and 7 that represented their attitudes toward the advertisements. Therefore, the researcher could compute an average attitude toward each ad and the overall attitude toward the interruptions by averaging the attitudes toward the three advertisements.

Attitude toward the Web site was measured using a seven-item Likert scale (1=Strongly disagree, 7=Strongly agree) used for the same purpose in previous research (Kalyanaraman, in press).

- *This Web site makes it easy for me to build a relationship with this company.*
- *I would like to visit this Web site again in the future.*
- *I'm satisfied with the service provided by this Web site.*
- *I feel comfortable in surfing this Web site.*
- *I feel surfing this Web site is a good way for me to spend my time.*
- *Compared with other news Web sites, I would rate this one as one of the best.*
- *I like the Web site.*

The reliability of this scale was high (Cronbach's $\alpha = .87$). For each story that participants read, they responded to three questions designed to measure the participants' level of interest in the stories and the importance they placed on them. Cronbach's α ranged from .85 to .93 for each of the stories.

Control variables

In order to bolster the external validity of the experiment, the stimuli included stories with news values of timeliness and importance, and advertisements featured companies with which participants would be familiar. Some questions after exposure to the stimuli were designed to measure interest, familiarity, involvement, and attention to the content of the stories and advertisements. Participants' responses to these questions primarily were used in initial data screening, which is discussed in the results section.

Responses to two statements provided measures of how much attention participants believed they paid to each pop-up advertisement. Participants rated their level of agreement (1=Strongly disagree, 7=Strongly agree) with the following statements:

- *I barely looked at the content of the Overstock.com/Alli/Sprint ad.*
- *I paid a great deal of attention to the Overstock.com/Alli/Sprint ad.*

Participants also rated their level of familiarity with each brand (1=Not at all familiar, 7=Very familiar) and whether they had used products from the business or brand. They responded to several questions about the topic of each story as well. For each of the three stories, participants rated their familiarity with the topic (1=Not at all familiar, 7=Very familiar). For analysis, the interruption and story familiarity ratings were averaged for the three stories as overall measures of interruption familiarity and story familiarity.

Participants also responded to a brief version of an involvement scale (adapted from Kalyanaraman & Sundar, 2006) where 1=Strongly disagree and 7=Strongly agree:

- *The content of this story said something important to me.*

- *The content of this story was meaningful for me.*
- *This story talked about something that concerned me.*

Responses to these statements about involvement allowed the creation of a measure of story importance to the participants. Responses to these statements were averaged for all three stories.

Participants responded to several scale items about each advertisement adapted from the Personal Involvement Inventory (Zaichkowsky, 1994). These items included the following anchors (some of which were reverse coded) on a seven-point scale:

- *Important/Unimportant*
- *Relevant/Irrelevant*
- *Involving/Uninvolving*
- *Needed/Unneeded*

The questionnaire also asked participants to report their gender, major, school classification, age, and their amount of Web use. All control variables listed here primarily were used in initial data screening. Several were used as control variables in hypothesis tests; participants' ratings of stories' importance and their self-report of attention paid to interruptions were initially considered for conceptual reasons. However, the degree of multicollinearity between these variables and others (see Table 4) eliminated this plan. Since all participants saw the same three topics in the stories they read and the same three products or brands in the interruptions they saw, the analyses for these studies controlled for participants' familiarity with the topics and products or brands.

Means for dependent variables and covariates, as well as a correlation matrix, are available in Tables 3 and 4.

Table 3. Dependent variables and covariates in Study 1

Variable	Mean score	Standard deviation	Sample size
Memory for interruption content	2.79	1.31	90
Memory for story content	7.53	2.14	90
Attitude to interruptions	4.02	0.73	90
Attitude to site	3.78	0.90	90
Time spent on site	9:46	2:54	90
Story importance	4.11	0.93	86
Attention to interruptions	1.89	0.98	90

Table 4. Correlation matrix for Study 1 variables

	Int. memory	Story memory	Total memory	Int. attitude	Site attitude	Time on site	Age	Daily Web use	Story importance	Attention to int.	Familiar with product	Familiar with story
Interruption memory	—											
Story memory	0.00	—										
Total memory	0.52***	0.85***	—									
Interruption attitude	-0.19	-0.41	-0.13	—								
Site attitude	0.08	0.15	0.17	-0.23*	—							
Time on site	0.09	0.19	0.21	0.03	0.03	—						
Age	-0.13	-0.05	-0.11	0.31**	-0.03	-0.16	—					
Daily Web use	-0.06	-0.22*	-0.22*	-0.02	-0.33***	0.09	0.11	—				
Story importance	0.09	0.22*	0.23*	-0.30**	0.47***	0.10	-0.12	-0.22*	—			
Attention to interruption	0.36***	0.05	0.23*	-0.34***	0.05	-0.07	-0.10	0.14	0.04	—		
Familiar with product	0.19	-0.13	-0.01	-0.17	0.28**	-0.05	-0.18	-0.17	0.15	-0.07	—	
Familiar with story	-0.04	0.04	0.02	-0.25*	0.41***	-0.06	-0.07	-0.11	0.59***	-0.05	0.18	—

* Significant at $p < .05$
** Significant at $p < .01$
*** Significant at $p < .001$

Procedure

The experiment was carried out in two computer labs at Abilene Christian University. The participants were enrolled in classes in the Department of Journalism and Mass Communication at the university, and they did not receive any incentive or class credit for their participation. The researcher set up the computer labs before each session, which accommodated up to 14 participants at a time. Participants were instructed to sit at the next available computer in the lab when they arrived, and a browser window on each computer screen told them to keep from touching the computer until instructed to begin the experiment. The lab computers were Apple iMacs running the browser Firefox, version 3.0.1. Participants provided informed consent (see Appendix D) and then were instructed to begin. Participants took about 30 minutes to read all three stories and respond to the questionnaire, and then they were thanked and debriefed.

Results

Preliminary analyses

Gender was examined as an independent variable (along with the other independent variables for the study — structural complexity of the interruption and interruption timing), but gender was not significant for any variable except memory for interruptions. It was dropped from all other analyses in this study. In addition, the researcher performed repeated-measures analyses to evaluate any potential differences in participants' responses based on the order in which they were exposed to each of the three stories and associated pop-up interruptions. Order effects were significant in some cases, and those results are reported when they were significant.

Tests of hypotheses

The study began with 124 participants across six conditions. The data were examined for univariate normality, and 12 cases were outliers on five or more of the 107 continuous variables examined. Four cases showed patterns in the responses that suggested that the participants did not answer questions thoughtfully, so these cases were deleted. Two additional cases were outliers on three of the seven compiled memory and attitude scales, so these cases were deleted. After filtering for normality, 106 cases remained, and between 16 and 20 participants were in each cell. A summary of hypotheses and findings is available in Table 1.

H1a: Users will recognize and recall simple interruptions better than complex interruptions.

H1b: Users will recognize and recall complex interruptions better than simple interruptions.

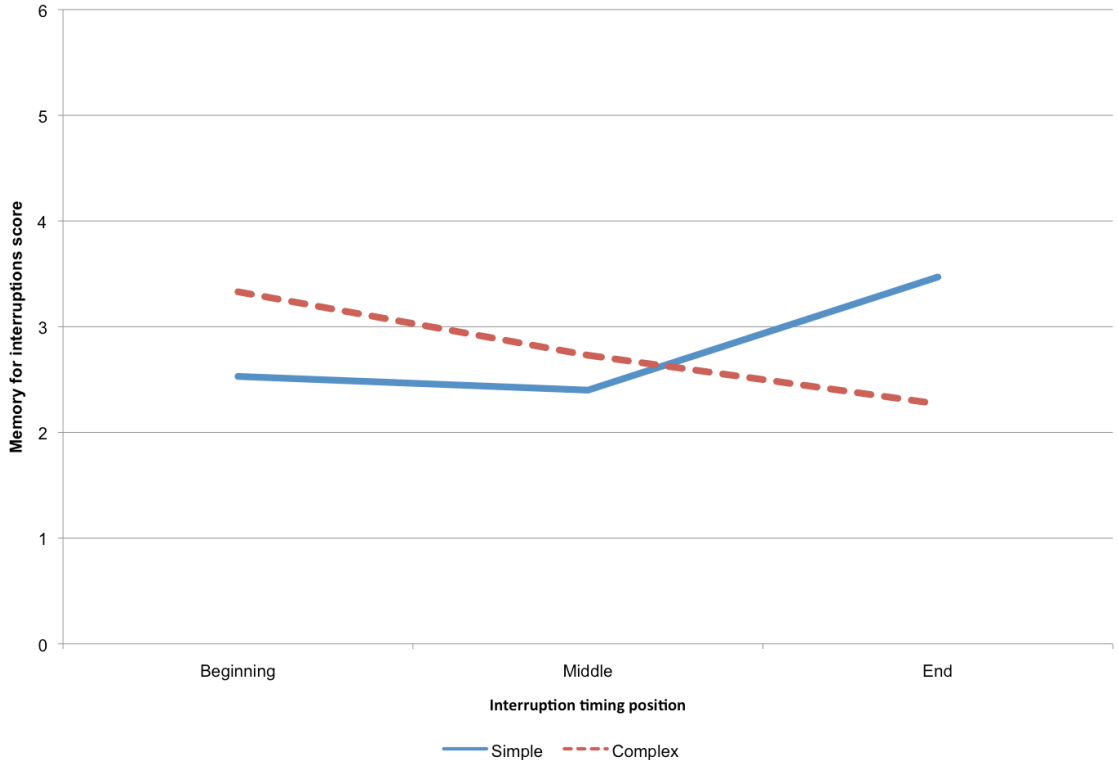
A two-way repeated-measures ANCOVA was performed, and it used structural complexity of the interruption, interruption timing, and gender as independent factors measured between subjects. Memory for interruptions as the dependent variable, and this was examined as a within-subjects variable divided by the order in which participants saw each story. Interruption familiarity and story familiarity were covariates. Gender had a significant effect, $F(1,77) = 6.21$, $p = .02$, partial $\eta^2 = .08$. Women received a higher score for interruption memory ($M = 3.02$, $SE = 0.15$) than men ($M = 2.12$, $SE = 0.25$). The number of men and women were highly uneven; 32.1% of participants ($N = 27$) were male. Story familiarity had no effect and was dropped from the analysis. Interruption familiarity had its own effects $F(1,83) = 5.76$, $p = .02$, partial $\eta^2 = .07$. Participants who

were below the median score for interruption familiarity, which was 3.02, demonstrated less memory for the content of the interruption ($M = 2.56$, $SE = .17$) than those who were above the median ($M = 3.01$, $SE = .22$).

There was a significant result for story position on Mauchly's Test of Sphericity (Mauchly's W = .87, $p < .01$), which calls for an adjustment of the degrees of freedom using the Huyhn-Feldt epsilon correction. There was a significant result for position in tests of within-subjects effects, $F(2,156) = 18.50$, $p < .001$. Participants had the greatest memory for the Alli interruption, regardless of its position ($M = 1.20$, $SE = .09$), then the Sprint interruption ($M = .85$, $SE = .08$), and lastly the Overstock.com interruption ($M = .51$, $SE = .08$).

However, there was no main effect of the structural complexity of interruptions, $F(1,83) = .01$, $p = .93$, partial $\eta^2 < .001$. Neither hypothesis was supported. However, a significant interaction emerged between structural complexity of the interruption and timing of the interruption, $F(2,83) = 6.42$, $p < .01$, partial $\eta^2 = .13$. Mean memory for the interruption generally increased as the interruption occurred later for simple interruptions (beginning $M = 2.50$, $SE = .32$; middle $M = 2.39$, $SE = .32$; end $M = 3.52$, $SE = .32$). Memory decreased as interruptions occurred later when the interruptions were complex (beginning $M = 3.39$, $SE = .32$; middle $M = 2.74$, $SE = .32$; end $M = 2.21$, $SE = .32$, see Figure 1).

Figure 1. Memory for interruptions by interruption timing and interruption complexity, with covariate interruption familiarity



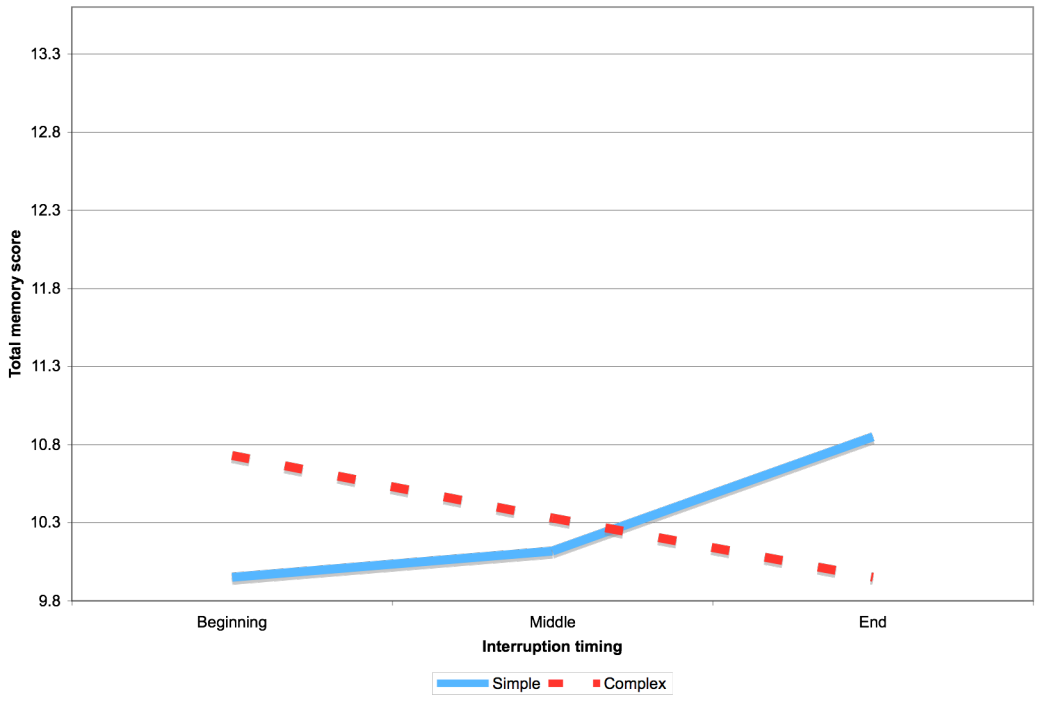
H2: Interruptions in the middle of a story will lead to worse recognition and recall for both the interruption and the story compared to interruptions at the beginning or end.

A repeated-measures ANCOVA was performed with interruption complexity and interruption timing as independent factors measured between subjects. Total memory was the dependent variable, examined within subjects by the order in which content was presented to participants. Interruption familiarity and story familiarity were covariates. The covariates were not significant and were dropped from analysis. Mauchly's Test of Sphericity was significant for story order (Mauchly's W = .89, p = .01), so the Huyhn-Feldt adjustment was used. Stories' order had a significant effect on total memory for

stimulus content, $F(1.98, 163.59) = 19.90$, $p < .001$. Participants had the greatest memory for the obesity story and Alli interruption ($M = 3.99$, $SE = .14$), then the phone line story and Sprint interruption ($M = 3.39$, $SE = .14$), and lastly the e-commerce story and Overstock.com interruption ($M = 2.94$, $SE = .11$).

The resulting test revealed no main effect of the timing of interruptions, $F(1,84) = 0.790$, $p = .50$, partial $\eta^2 = .02$. This hypothesis was not supported. However, an interaction between structural complexity of the interruption and timing of the interruption emerged, $F(2,78) = 4.96$, $p = .01$, partial $\eta^2 = .11$. Later appearance of interruptions improved memory for content when the interruptions were simple and degraded memory for content when interruptions were complex (see Figure 2).

Figure 2. Memory for story and interruption by interruption timing and interruption complexity



H3: Interruptions in the middle of a story will lead to more time spent on the primary task compared to interruptions at the beginning or end.

An ANCOVA was performed with interruption complexity and interruption timing as independent factors and total memory as the dependent variable, and interruption familiarity and story familiarity were covariates. The covariates were not significant and were dropped from analysis. The model was not significant, $F(6,83) = 1.08$, $p = .38$, partial $\eta^2 = .07$, and there were no main effects or interactions of the independent variables. This hypothesis was not supported.

H4: Users will have more negative attitudes toward complex interruptions than simple interruptions.

A repeated-measures ANCOVA was performed with interruption complexity and interruption timing as independent factors measured between subjects. Attitude toward interruptions was the dependent variable, and this was examined as a within-subjects variable by the order in which the interruptions were presented. Interruption familiarity and story familiarity were covariates. The covariates were not significant and were dropped from analysis. Mauchly's Test of Sphericity was significant for order effects in attitude toward the interruption (Mauchly's W = .91, $p = .02$), so the Huyhn-Feldt adjustment was used. Interruptions' order had a significant effect on attitude toward interruptions, $F(1.99, 166.72) = 22.55$, $p < .001$. Participants had the most positive attitudes toward the Overstock.com advertisement that interrupted a story about e-commerce ($M = 4.35$, $SE = .09$), then the Alli advertisement that interrupted the story about obesity ($M = 4.09$, $SE = .09$), and lastly the Sprint advertisement that interrupted

the story about phone lines (M = 3.62, SE = .10). There was no main effect of interruption complexity, $F(1,88) = 3.33$, $p = .07$, partial $\eta^2 = .04$. This hypothesis was not supported.

H5: Users will have more negative attitudes toward late interruptions than early ones.

A repeated-measures ANCOVA was performed with interruption complexity and interruption timing as between-subjects independent factors. Attitude toward interruptions was the dependent variable examined as a within-subjects variable by the order in which stories were presented to participants. Interruption familiarity and story familiarity were covariates. The covariates were not significant and were dropped from analysis. There was no main effect of interruption timing, $F(2,87) = 1.10$, $p = .34$, partial $\eta^2 = .03$. This hypothesis was not supported. However, some order effects emerged in the repeated-measures analysis. Mauchly's Test of Sphericity was significant for order effects in attitude toward the interruption (Mauchly's W = .91, $p = .02$), so the Huyhn-Feldt adjustment was used. Interruptions' order had a significant effect on attitude toward interruptions, $F(1.99, 166.72) = 22.55$, $p < .001$. Participants had the most positive attitudes toward the Overstock.com advertisement that interrupted a story about e-commerce (M = 4.35, SE = .09), then the Alli advertisement that interrupted the story about obesity (M = 4.09, SE = .09), and lastly the Sprint advertisement that interrupted the story about phone lines (M = 3.62, SE = .10).

H6: Users will have more negative attitudes toward the Web site for complex interruptions than they will for simple interruptions.

An ANCOVA was performed with interruption complexity and interruption timing as independent factors and attitude toward the Web site as the dependent variable,

with interruption familiarity and story familiarity as covariates. Interruption familiarity was significant as a covariate, $F(1,88) = 4.11$, $p = .05$, partial $\eta^2 = .05$. Participants who were more familiar with the brands presented in the interruptions (above the median) had more positive attitudes toward the site ($M = 4.05$, $SE = .16$) than those who were less familiar with the companies represented ($M = 3.54$, $SE = .14$). For story familiarity, $F(1,88) = 13.79$, $p < .001$, partial $\eta^2 = .14$, a similar pattern emerged. Participants above the median level of familiarity with the content presented in the stories had more positive attitudes toward the site ($M = 4.07$, $SE = .15$) than those who were less familiar with the topics presented ($M = 3.47$, $SE = .15$). However, there was no main effect of structural complexity of the interruption, $F(1,88) = 0.38$, $p = .54$, partial $\eta^2 = .01$. This hypothesis was not supported.

H7: Users will have more negative attitudes toward the Web site for late interruptions than earlier ones.

An ANCOVA was performed with interruption complexity and interruption timing as independent factors and attitude toward the Web site as the dependent variable, and used interruption familiarity and story familiarity as covariates. Interruption familiarity was a significant covariate, $F(1,88) = 4.11$, $p = .05$, partial $\eta^2 = .05$. Participants who were more familiar with the brands presented in the interruptions (above the median) had more positive attitudes toward the site ($M = 4.05$, $SE = .16$) than those who were less familiar with the companies represented ($M = 3.54$, $SE = .14$). For story familiarity, $F(1,88) = 13.79$, $p < .001$, partial $\eta^2 = .14$, a similar pattern emerged. Participants above the median level of familiarity with the content presented in the stories had more positive attitudes toward the site ($M = 4.07$, $SE = .15$) than those who were less

familiar with the topics presented (M = 3.47, SE = .15). There was no main effect of interruption timing, $F(2,87) = 0.74$, $p = .48$, partial $\eta^2 = .02$. This hypothesis was not supported.

H8: Users will have better memory for story content when they encounter simple interruptions that occur late in the task than when complex interruptions occur late.

An ANCOVA was performed with interruption complexity and interruption timing as independent factors and story memory as the dependent variable, and interruption familiarity and story familiarity were used as covariates. The covariates were not significant and were dropped from analysis. There was no interaction between structural complexity of the interruption and interruption timing, $F(2,87) = 2.04$, $p = .14$, partial $\eta^2 = .05$. This hypothesis was not supported.

H9: Users will have more negative attitudes toward complex interruptions that occur late in the task than toward simple interruptions that occur late.

A repeated-measures ANCOVA was performed, with interruption complexity and interruption timing as between-subjects independent factors. Attitude toward interruptions was the dependent variable examined as a within-subjects factor by the order in which stories were presented to participants. Interruption familiarity and story familiarity were covariates. The covariates were not significant and were dropped from analysis. Mauchly's Test of Sphericity was significant for order effects in attitude toward the interruption (Mauchly's W = .91, $p = .02$), so the Huyhn-Feldt adjustment was used. Interruptions' order had a significant effect on attitude toward interruptions, $F(1.99, 166.72) = 22.55$, $p < .001$. Participants had the most positive attitudes toward the Overstock.com advertisement that interrupted a story about e-commerce (M = 4.35, SE =

.09), then the Alli advertisement that interrupted the story about obesity (M = 4.09, SE = .09), and lastly the Sprint advertisement that interrupted the story about phone lines (M = 3.62, SE = .10). There was no interaction between structural complexity of the interruption and interruption timing, $F(2,87) = 0.28$, $p = .76$, partial $\eta^2 = .01$. This hypothesis was not supported.

Discussion

The results of this study are a bit of a puzzle because several did not conform to expectations. Previous findings made a good case for the hypotheses in this study, but many were not supported. However, some interesting patterns appeared in the results and are discussed here.

Memory

On its own, the structural complexity of an interruption did not affect memory for the interruption. This might suggest that changing a structural element of an interruption — in this case, the user's ability to easily and quickly close the interruption — does not add enough additional information to process to change the cognitive load. This would explain why the first of the competing hypotheses about structural complexity and memory for the interruption was supported; this hypothesis relied on the amount of information processed. However, the interaction between structural complexity of the interruption and timing created an inverse pattern of results for the two levels of structural complexity. Participants' memory levels for simple interruptions increased from exposure at the beginning to the end. Memory levels were highest for complex interruptions at the beginning and fell as interruptions occurred later. This seems to indicate some action of the structural complexity of the interruption.

The second of the competing hypotheses about structural complexity and memory relied on the effort expended under cognitive load (Kahneman, 1973) to explain a difference between memory for simple and complex interruptions. The responses of many participants indicated that they paid little attention to the interruptions, whether simple or complex. The questionnaire asked participants to write in the names of the companies featured in the pop-up advertisements. Many participants wrote things like, "I didn't pay attention. I just closed it," and "I didn't read it because I immediatly [*sic*] closed the pop-up out of habit." The quantitative assessment of attention to the interruptions supported those comments; participants reported a mean level of attention to the pop-up advertisements of 1.89 on a scale of 1 to 7. There was no significant difference in attention to the interruption between those who saw simple interruptions and those who saw complex interruptions, $t(88) = .92$, $p = .36$. As is common with many laboratory experiments, many participants likely exerted little effort overall.

As with the structural complexity of interruptions on memory for the interruption or story, the timing of an interruption had no effect alone on participants' memory for both the interruption and story. However, it is possible that the manipulation of interruption timing may not have been entirely successful. Participants began the experiment on a splash screen with instructions and then clicked links that took them linearly from one story to the next. Interruptions at the beginning of a story loaded simultaneously with the story, so the participants actually encountered the interruption at the same time as the story, if not before. Participants had no opportunity to see what the present task was before they were "interrupted." Similarly, interruptions at the end of stories appeared as participants clicked to go to the next story. They may have been

mentally finished with the story at that point, making the interruption at the end more of an interstitial interruption.

Many journalists and editors traditionally have resented the intrusion of advertisements on the stories they produce, but they still acknowledge that advertising pays a news organization's bills. Journalists may be even more resentful of advertisements on a news Web site when these have not been very profitable online to date. This study suggests that pop-up advertisements can affect readers' memory for online news stories. The current results indicate that further studies of structural complexity and interruption timing would be useful in order to more firmly establish which types of advertisements and their placements would be most beneficial to news sites and their advertisers in terms of ensuring the highest possible memory in audience members.

Attitudes

The lack of any significant findings about participants' attitudes toward interruptions and the Web site is surprising. The stories on the site were of moderate importance ($M = 4.11$) and were moderately involving ($M = 4.30$) to participants. Perhaps the stories were so bland that participants couldn't muster a reaction. It is possible that readers would have more negative attitudes toward interruptions during stories selected by themselves. This might also be true for stories with content of greater interest to readers or that were written in a way that increased involvement. Stories that are highly interesting to participants might increase motivation, which could affect results about both attitudes and memory.

Although the results to this study were unexpected, they provided interesting avenues for continued research. It is debatable whether, by itself, the increased structural complexity of complex interruptions provided a great enough increase in cognitive load over the load created by simple interruptions, so Study 2 added an additional variable to give participants more information to process in the stories they read. The results of this study go against the grain of previous research. It is possible that the effects of structural elements of an interruption — and their complexity — and interruption timing are only evident when Web users cross a certain threshold of information to process. Study 2 gave participants short and long versions of stories to read. Varying the complexity of the primary task by changing the amount of information that participants had to process had the potential for effects on its own, as well as interactions with structural complexity and interruption timing.

CHAPTER THREE

STUDY TWO

Studies about interruption timing have focused on decision making or work productivity. This pair of studies demonstrates the effects on memory and attitude of an interruption at the beginning, middle, or end of a relatively contained informational task. The first study varied two factors about the interruption itself, but the experience of an interruption also involves the primary task. This study adds manipulation of the primary task to the design proposed for the first study.

Hypotheses

The second study expands on the design of the first study by varying complexity of the primary task in addition to the structural complexity of the interruption and its temporal location. The 10 hypotheses from Study 1 were tested again, in addition to several other hypotheses. The reading complexity of a story increases when there is more information to process, so a long story is more complex than a short story. Simple and short stories should place a lighter cognitive load on users than long and complex stories. Since various subprocesses draw from the same limited pool of mental resources (Bettman, 1979; Lang, 2007), short stories will require fewer resources allocated to the encoding subprocess. LC4MP suggests that users should have better memory for short stories than longer ones. In addition, interruptions slow cognitively complex tasks because people have a hard time reorienting to the primary task (Burmistrov & Leonova,

2003). An experimental situation may inspire low involvement in a situation that already acts as a rapid exchange, such as reading online news. In these conditions, participants are unlikely to make extra effort to reorient to the primary task after the interruption. This suggests that memory will decrease when participants have more to process. However, Kahneman (1973) suggested that people exerted more effort when facing greater demands on their cognitive resources. Therefore, the following competing hypotheses must be tested.

H10a: As story length increases, recognition and recall for the story will decrease.

H10b: As story length increases, recognition and recall for the story will increase.

Part of maintaining good flow (Csikszentmihalyi, 1990) is taking breaks at appropriate times. When mental resources are taxed, users may appreciate a brief respite from their tasks. Therefore, users may have more positive attitudes about interruptions during long stories than short ones, regardless of any effects the interruption may have on memory or time on task, as Kalyanaraman (in press) suggested. In fact, Coraggio (1990) showed that brief interruptions reduced task performance by nearly half for complex tasks, but subjects appreciated interruptions for stress relief. However, users may just want to finish the primary task if they have negative attitudes toward the story. They may find the story tedious and simply want to finish the task, and anything that increases the amount of time they must spend on the task will be tarred by negative perceptions, as well. Accordingly, the researcher will test competing hypotheses.

H11a: As story length increases, users will have more positive attitudes toward interruptions.

H11b: As story length increases, users will have more negative attitudes toward interruptions.

Method

Study 2 continues the interruption complexity and interruption timing variables from the first study, and it also varies the length of the target story that participants read. The amount of content in the target story added an additional variable of complexity because some participants had to process more information than others. The 2 (interruption complexity) x 3 (interruption timing) x 2 (story length) x 3 (story order) mixed measures design three between-subjects conditions: interruption complexity, interruption timing, and story length. In the within-subjects condition, story order, all participants read the same three stories, but they were presented in one of three orders. The experiment had 12 conditions, and 20 students participated in each condition. Participants were 242 students at the University of North Carolina, and they participated in exchange for course credit as part of the participant pool in the School of Journalism and Mass Communication. The number of participants in each session ranged from one to 12, and they used PCs running Windows and Firefox, version 3.0.6. Most participants (72.4%) were women, and the mean age was 20.6 years.

The procedure and questionnaire were the same as Study 1. All participants read three news stories, presented in various order within each condition, and encountered an interruption during each story that either was stationary or moving and that occurred at the beginning, middle, or end of each story. A third independent variable, story

complexity, was added to this study. Participants in the simple condition read 400-word versions of each story. Participants in the complex condition read 1,000-word versions of the same stories. The longer versions of the stories contained the same information as the 400-word versions, but the longer versions also provided additional information as the stories continued. Means for dependent variables and covariates, as well as a correlation matrix, are available in Tables 5 and 6.

A question that has received little concentrated attention in the study of interruptions is the effect of complexity of the primary task. By varying story length, this study seeks to contribute knowledge about potential relationships between interruptions and story complexity and any effects this may have on memory for the story and attitude toward the site.

Table 5. Dependent variables and covariates in Study 2

Variables	Mean score	Standard deviation	Sample size
Memory for interruptions	3.12	1.44	214
Memory for story	8.71	1.87	214
Attitude to interruptions	4.08	0.72	214
Attitude to site	3.52	1.08	214
Time spent on site	9:31	4:04	214
Story importance	4.33	0.87	202
Attention to ads	1.81	1.03	214

Table 6. Correlation matrix for Study 2 variables

	Int. memory	Story memory	Total memory	Int. attitude	Site attitude	Time on site	Age	Daily Web use	Story importance	Attention to int.	Familiar with product	Familiar with story
Interruption memory	—											
Story memory	0.01	—										
Total memory	0.62***	0.79***	—									
Interruption attitude	-0.32***	0.07	-0.14	—								
Site attitude	-0.09	0.10	0.03	-0.17*	—							
Time on site	0.06	0.15*	0.16*	-0.05	0.17*	—						
Age	0.01	0.09	0.06	0.10	-0.04	-0.09	—					
Daily Web use	-0.06	0.01	-0.03	0.17*	-0.09	0.00	0.05	—				
Story importance	0.00	0.17*	0.13	-0.13	0.37**	0.16*	0.03	0.01	—			
Attention to interruption	0.28***	-0.05	0.13	-0.40***	0.06	0.11	-0.15*	-0.01	0.18*	—		
Familiar with product	0.25***	0.06	0.20**	-0.12	-0.15*	-0.01	-0.03	-0.14	0.11	0.10	—	
Familiar with story	0.01	0.28***	0.22***	0.01	0.01	0.05	0.04	0.08	0.51***	.04	0.21***	—

* Significant at $p < .05$
** Significant at $p < .01$
*** Significant at $p < .001$

Results

The study began with 242 participants across 12 conditions. The data were examined for univariate normality, and 25 cases were outliers on six or more of the 107 continuous variables examined. A visual analysis of the responses showed one case in which the respondent marked the same number for every question in the attitude scales, so this case was deleted. In two cases, the respondents did not record the condition numbers they had been assigned, so these cases were deleted. Two hundred fourteen cases remained after filtering, and each of the 12 conditions had between 16 and 20 participants. A summary of hypotheses and results is available in Table 7.

Preliminary analyses

Gender was initially examined in an ANOVA as an independent variable and was significant for two dependent variables, and the significant findings are reported with the appropriate hypotheses. The researcher performed repeated-measures analyses to evaluate any potential differences in participants' responses based on the order in which they were exposed to each of the three stories and associated pop-up interruptions. ANOVA examined effects of stimulus position on memory for interruptions, story memory, and attitude toward the interruption. Story order initially was added as a within-subjects variable in all analyses for this study. However, order effects were not significant in any analysis, and the repeated-measures approach was dropped for all further analyses in this study.

Tests of hypotheses

H1a: Users will recognize and recall simple interruptions better than complex interruptions.

H1b: Users will recognize and recall complex interruptions better than simple interruptions.

An ANCOVA was performed with interruption complexity, interruption timing, story length, and gender as independent factors and interruption memory as the dependent variable, with interruption familiarity and story familiarity as covariates. Story familiarity was not significant as a covariate, but interruption familiarity was: $F(1,177) = 5.45$, $p = .02$, partial $\eta^2 = .03$. Participants who were above the median in familiarity with the companies presented in the interruptions had greater memory for the content of the interruptions ($M = 3.57$, $SE = .14$) than participants who were below the median familiarity ($M = 2.69$, $SE = .15$). There was a significant difference by gender for memory for interruptions, $F(1,164) = 4.44$, $p = .04$, partial $\eta^2 = .03$. Women had greater memory for interruption content ($M = 3.25$, $SE = 0.12$) than men ($M = 2.72$, $SE = 0.22$). This sample also had many more women (72.4% of participants, $N = 155$) than men.

There was no main effect of the structural complexity of the interruption, $F(1,177) = 0.44$, $p = .52$, partial $\eta^2 < .01$. Neither hypothesis was supported.

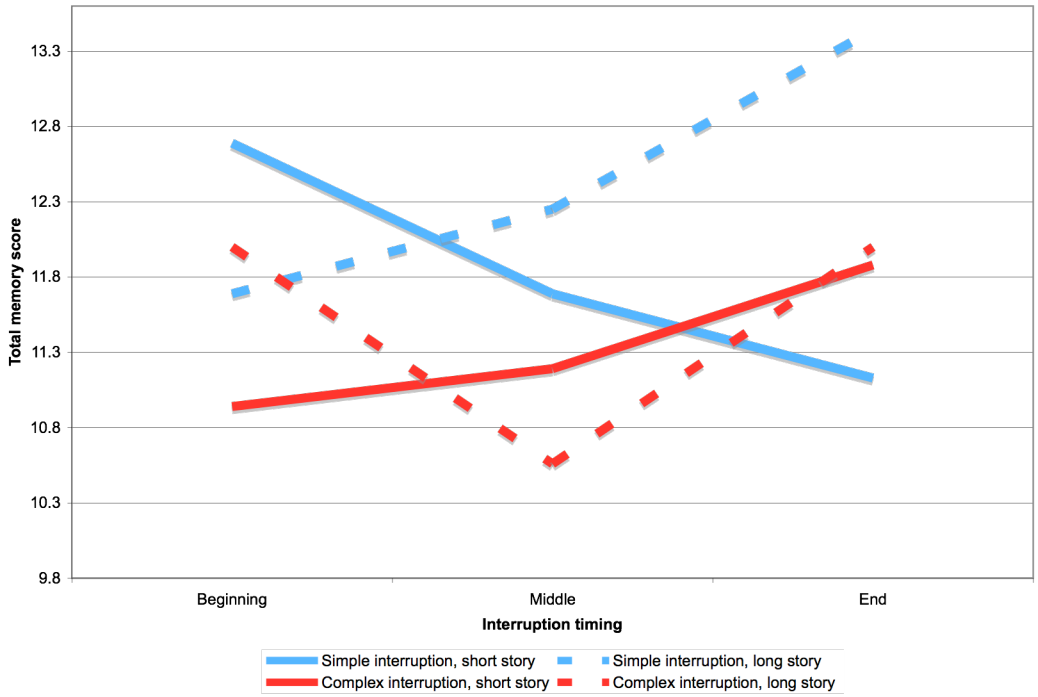
H2: Interruptions in the middle of a story will lead to worse recognition and recall for both the interruption and the story compared to interruptions at the beginning or end.

An ANCOVA was performed with interruption complexity, interruption timing, and story length as independent factors and story memory as the dependent variable, with interruption familiarity and story familiarity as covariates. Interruption familiarity was not significant as a covariate, but story familiarity was: $F(1,178) = 8.17$, $p = .01$, partial $\eta^2 = 04$. Participants who were above the median level of familiarity with the topics

presented in the stories had greater memory for story content ($M = 9.21$, $SE = .20$) than those who were below the median level of story familiarity ($M = 8.32$, $SE = .19$).

There was no main effect of interruption timing, but structural complexity of the interruption had a main effect, $F(1,177) = 5.29$, $p = .02$, partial $\eta^2 = .03$. Participants exposed to simple interruptions showed greater memory for interruption and story content ($M = 12.17$, $SE = .23$) than those who saw complex interruptions ($M = 11.41$, $SE = .23$). There was a significant three-way interaction between the independent variables structural complexity of the interruption, timing of the interruption, and complexity of the story, $F(2,178) = 3.24$, $p = .04$, partial $\eta^2 = .04$. When participants encountered simple interruptions, memory decreased as interruptions occurred later in short stories. Conversely, memory increased as interruptions occurred later in long stories. When participants encountered complex interruptions, memory increased as interruptions occurred later in short stories. In long stories, participants' memory scores were lower when interrupted in the middle than at the beginning or end (see Figure 3).

Figure 3. Memory for story and interruption by interruption timing, interruption complexity, and story length, with covariate story familiarity



H3: Interruptions in the middle of a story will lead to more time spent on the primary task compared to interruptions at the beginning or end.

An ANCOVA was performed with interruption complexity, interruption timing, and story length as independent factors and time spent on the Focus News Web site as the dependent variable, with interruption familiarity and story familiarity as covariates. The covariates were not significant and were dropped from further analysis. Levene's Test of Equality of Error Variances was significant, $F(11,180) = 3.62$, $p < .001$, so the results of this test must be considered with hesitancy. Timing of the interruption had no significant main effect, $F(2,180) = 2.26$, $p = .11$, partial $\eta^2 = .03$. This hypothesis was not supported.

H4: Users will have more negative attitudes toward complex interruptions than simple interruptions.

An ANCOVA was performed with interruption complexity, interruption timing, story length, and gender as independent factors and attitude toward interruptions as the dependent variable, with interruption familiarity and story familiarity as covariates. The covariates were not significant and were dropped from further analysis. There was a significant effect of gender on attitude toward interruptions, $F(1,180) = 11.15$, $p < .001$, partial $\eta^2 = .06$. Men had slightly more positive attitudes toward interruptions ($M = 4.39$, $SE = .10$) than did women ($M = 4.01$, $SE = .06$). There was no main effect of structural complexity of interruptions on attitude, $F(1,180) = 0.00$, $p = .99$, partial $\eta^2 < .001$. This hypothesis was not supported.

H5: Users will have more negative attitudes toward late interruptions than early ones.

An ANCOVA was performed with interruption complexity, interruption timing, and story length as independent factors and attitude toward interruptions as the dependent variable, and interruption familiarity and story familiarity were covariates. The covariates were not significant and were dropped from further analysis. There was no main effect of interruption timing on attitude, $F(1,180) = 1.90$, $p = .15$, partial $\eta^2 = .02$. This hypothesis was not supported.

H6: Users will have more negative attitudes toward the Web site for complex interruptions than simple interruptions.

An ANCOVA was performed with interruption complexity, interruption timing, and story length as independent factors and attitude toward the Web site as the dependent

variable, and interruption familiarity and story familiarity were covariates. The covariates were not significant and were dropped from further analysis. There was no main effect of structural complexity of the interruption on attitude, $F(12,177) = 0.71$, $p = .74$, partial $\eta^2 = .05$. This hypothesis was not supported.

H7: Users will have more negative attitudes toward the Web site for late interruptions than earlier ones.

An ANCOVA was performed with interruption complexity, interruption timing, and story length as independent factors and attitude toward the Web site as the dependent variable, and interruption familiarity and story familiarity were covariates. The covariates were not significant and were dropped from further analysis. There was no main effect of interruption timing on attitude, $F(12,177) = 0.71$, $p = .74$, partial $\eta^2 = .05$. This hypothesis was not supported.

H8: Users will have better memory for story content when they encounter simple interruptions that occur late in the task than when complex interruptions occur late.

An ANCOVA was performed with interruption complexity, interruption timing, and story length as independent factors and story memory as the dependent variable, and interruption familiarity and story familiarity were covariates. Interruption familiarity was not significant as a covariate, but story familiarity was: $F(1,179) = 11.70$, $p < .001$, partial $\eta^2 = .06$. Participants who were above the median level of familiarity with the topics presented in the stories had greater memory for story content ($M = 9.21$, $SE = .20$) than those who were below the median level of story familiarity ($M = 8.32$, $SE = .19$). There were no significant main effects of the independent variables, and there was no

significant interaction between interruption timing and structural complexity of the interruption, $F(2,178) = .43$, $p = .65$, partial $\eta^2 = .01$. This hypothesis was not supported.

H9: Users will have more negative attitudes toward complex interruptions that occur late in the task than toward simple interruptions that occur late.

An ANCOVA was performed with interruption complexity, interruption timing, and story length as independent factors and attitude toward interruptions as the dependent variable, and interruption familiarity and story familiarity were covariates. The covariates were not significant and were dropped from further analysis. There were no significant main effects of the independent variables, and there was no significant interaction between interruption timing and structural complexity of the interruption, $F(2,178) = .62$, $p = .54$, partial $\eta^2 = .01$. This hypothesis was not supported.

H10a: As story length increases, recognition and recall for the story will decrease.

H10b: As story length increases, recognition and recall for the story will increase.

An ANCOVA was performed with interruption complexity, interruption timing, and story length as independent factors and story memory as the dependent variable, and interruption familiarity and story familiarity were covariates. Interruption familiarity was not significant as a covariate and was dropped from further analysis, but story familiarity was significant: $F(1,179) = 11.70$, $p < .001$, partial $\eta^2 = .06$. Participants who were above the median level of familiarity with the topics presented in the stories had greater memory for story content ($M = 9.21$, $SE = .20$) than those who were below the median

level of story familiarity (M = 8.32, SE = .19). There was no significant main effect of the story length, $F(1,178) = 0.73$, $p = .40$, partial $\eta^2 < .01$. Neither hypothesis was supported.

H11a: As story length increases, users will have more positive attitudes toward interruptions.

H11b: As story length increases, users will have more negative attitudes toward interruptions.

An ANCOVA was performed with interruption complexity, interruption timing, and story length as independent factors and attitude toward interruptions as the dependent variable, and interruption familiarity and story familiarity were covariates. The covariates were not significant and were dropped from further analysis. There was no significant main effect of the story length on attitudes, $F(1,180) = 0.09$, $p = .76$, partial $\eta^2 < .01$. Neither hypothesis was supported.

Discussion

The results of this study aligned closely with Study 1, particularly in tests of participants' memory. Study 2 allowed a look at the effect of cognitive load.

Memory

The structural complexity of an interruption alone did not affect participants' memory for interruptions. Timing of the interruption and length of the story had no effect individually, either. However, the cumulative amount of information that readers had to process did affect memory for the content of the stories and interruptions. When simple interruptions occurred in short stories, later interruptions led to lower memory scores in participants; simple interruptions in long stories led to higher memory scores when interruptions were later. When complex interruptions occurred in short stories, later

interruptions led to higher memory scores; for complex interruptions in long stories, participants' memory scores suffered most when they were interrupted in the middle. Sorting through these patterns suggests support for Kahneman's (1973) contention that people exert more effort when under greater cognitive load. The amount of information to process increases as a story continues because people must integrate the new information they are acquiring with information from earlier in the story. Interruptions that pop up in the middle or at the end of a story appear at a time that cognitive load is increased, and the increased structural complexity of the interruption adds an additional layer of information to process. Short stories with simple interruptions was the only condition in which overall memory decreased as interruptions occurred later. As interruptions became more complex and stories grew longer, memory increased over time, for the most part.

Attitudes

As in Study 1, there were no significant findings about participants' attitudes toward interruptions or the Web site. It is possible that even though the scales used to measure participants' attitudes toward the interruptions and the Web site were unified in concept, they were actually tapping participants' reactions to features within these structures, which might have inhibited measurement. The participants of this study were fairly homogenous in terms of age, education, and Web usage, and it is very likely that older users or those who spend less time online would react differently to the interruptions, so other populations should be tested in this area.

CHAPTER FOUR

CONCLUSIONS

These studies found no support for the proposed hypotheses, and the experiments may not have worked as well as hoped. The effort was not wasted, though. People report paying very little attention to pop-up interruptions, and many have a habit of closing them on sight. Yet their presence combined with several other variables does affect readers.

Although the results are not clear enough to offer resounding support, the pattern of evidence, particularly in Study 2, supports further examination of Kahneman's (1973) contention that people exert more effort when under greater cognitive load. If this is the case, then people should have higher recognition and recall rates when they process more complex stories and interruptions. This would be good news for online news providers; the more information they offer within their stories, the more that the site's visitors will take away. This effect would only be enhanced by the presence of a complex interruption. However, this preliminary conclusion needs far more research before this can be stated definitively. The Kahneman framework was the most promising; the LC4MP framework (Lang, 2007) was not predictive in this study. The ambiguous nature of the studies' findings means the model should not be ruled out, but people do not process and respond to stimuli the same way in different media. This means it is possible that the LC4MP model might not prove helpful for predicting processing of online messages when users

face interruptions. However, stimuli that raise or lower motivation rather than working from a neutral point would likely make this model more applicable.

One assumption of LC4MP is that people are motivated by their appetitive or aversive systems. The fact that the news stories read by participants were merely moderately interesting to them may have been a problem in this respect. If participants' interest did not motivate them to be particularly attentive or involved in a story, it may have interfered with the attempt to measure the effect of story complexity. Perhaps this variable would be ideally studied when participants are exposed either to extremely interesting content or content that did not interest them at all. Either of these scenarios is likely to lead to more motivation in participants than stories that leave them no truly positive nor negative reactions. Content for future studies should be pretested for high and low levels of interest in participants.

Kahneman's object-based theories of visual attention (1973) suggest that an object's status determines the attention allocated to it (Diao & Sundar, 2004). A number of participants in this study reported that they ignored interruptions entirely or barely looked at them, at best. Interruptions that arise over more precise areas of the computer screen — such as directly over the text an individual is reading at that time — or that can't be clicked away from would be able to place the interruption as an object at the forefront. Kahneman's framework showed promise in the present studies, and it would be interesting to enhance the status of interruptions to see whether that affects individuals' recognition and recall for story and interruption content.

It is possible that an increase in structural complexity did not increase cognitive load to the degree that would have decreased recognition and recall of the interruptions

and stories. This could have been an issue of operationalization since some evidence exists that a story's packaging affects the resources allocated to it (Grabe, Lang, & Zhao, 2003). Other structural elements could be manipulated in the future, such as photo use and animation, in addition to making complex interruptions more difficult to close, which was the manipulation used in these studies. It is possible, though unlikely, that structural complexity does not affect readers in the ways expected. However, a great deal more research would be needed to say this confidently. Greater manipulation of story complexity is also desirable; perhaps adjusting the story's reading level or the number of elements included would raise cognitive load to a greater degree.

Both news providers and advertisers appear to win with audience members' memory when stories and interruptions are complex, but the situation is not entirely clear-cut. As complex interruptions occur later in a story, overall memory — which includes both the story and the content of the pop-up advertisement — decreases. Although there appear to be conditions in which overall memory is as high at the end as the beginning (when the story and interruption both are complex), the safest position for an interruption if the goal is to protect overall memory for the story and interruption is at the beginning. Although a complex interruption at the beginning of a complex story is a happy medium for both news providers and advertisers, other types of interruptions may be the most advantageous for news providers. The results in both studies for the effect of structural complexity of the interruption on memory for the story alone, not both the story and interruption together, indicate that memory for the story is best when interruptions are structurally simple. Perhaps news providers are willing to give up some memory for

their stories in exchange for financial support of advertisers, but it is important for them to acknowledge that there may be a trade off.

An important question is what an interruption has to do to arouse any particularly positive or negative affect. Previous studies have found that interruptions, particularly pop-up advertisements, annoy users. But for frequent, young computer users, the interruption of a pop-up advertisement may have simply become so tightly woven into the fabric of our Web experiences that the annoyance is no longer so pronounced as it once was. It is possible that these users have attenuated to the effects of the interruption. This may not be true of all groups of users, but these participants found the interruptions utterly unremarkable, no matter their structure or timing.

Limitations

A number of studies have found that people do not always respond to online stimuli the same way they respond to similar stimuli in other media, which can make it difficult to predict outcomes. In this case, however, some qualitative data from a small sample of the participants in Study 2 indicates an issue that may have affected the data collected in these studies. Participants said they knew the Focus News site was created for the purposes of the study, so they knew that their comments were not being used to help develop the site. The fact that participants were somewhat detached from the site and content likely inhibited the effort they exerted and the responses they gave. A more developed site and authentic browsing experience rather than a linked chain of stories might provide more useful stimuli to test these hypotheses.

During the first study, participants were not specifically instructed to close the pop-up windows before preceding to the questionnaire, so it is possible that some

memory scores for the interruptions are inflated if participants looked at the pop-up windows that still were open. This hole was closed in the second study by a window that instructed participants to close any windows that remained open.

The two studies were run back-to-back. Some elements of Study 2 should have been changed, but these will have to be addressed in future studies. It is not clear whether the additional effort needed to close complex interruptions alone varies the cognitive load enough to effectively measure the effect of structural complexity of an interruption. Some instructions need to be clarified, and the Web site ought to have a more realistic appearance to address the problems that the qualitative data indicated.

Timing of interruptions in these studies showed little effect by itself on participants' memory or attitudes. Interruptions at the beginning of a story loaded concurrently with the story content, and users may not have truly registered this as an interruption because of the structure of these experimental sessions. In a normal Web browsing session when an individual is reading a news site, he or she would see an interesting headline, click on it, wait for the story to load, and then read it. An ideal example of an interruption at the beginning of a story would be a pop-up window that appeared after the user clicked on the headline and was waiting for the story. In this study, users simply clicked on a "next" button, and they had no mental investment in what would actually appear next. They were not aware of what their next task would be, so they were unable to be interrupted in the task at this point in the purest sense. It is possible that the same principle applies for interruptions that appeared at the end of stories. Since participants did not know where they were going next, the interruption at the end could have been more of an intermission than an interruption.

These problems could be addressed by having participants engage in more natural browsing sessions rather than leading them through linear streams of content. There are also other ways to manipulate interruption timing, such as absolute timing. For instance, an interruption at the beginning of a story could load after three seconds, an interruption in the middle could load after 30 seconds, and an interruption at the end could load after 60 seconds. The problem with this type of operationalization is that it is impossible to predict an individual's behavior on a Web page. An individual may load a Web page and then tend to a hangnail for 40 seconds. In that scenario, there would be no difference between an interruption at the beginning or the middle for that individual. Because researchers are not able to control participants' behavior or attention once they load a Web page, researchers are probably best served by remaining with behavioral triggers. Interruptions triggered by page loads, scrolling past a certain point, and mousing over a particular area allow the timing of interruptions to be customized to individual participants.

Future research

This study should be replicated with stimuli that have greater external validity both in order to increase participants' motivation and to make sure the operationalization of the timing of the interruption is effective. Future studies need to determine whether structural changes to an interruption are sufficient manipulations of the cognitive load that computer users face. Participants may not have been adequately motivated in these studies, so replication with extremely interesting and extremely boring stories should be attempted. Several options exist for making the interruptions more prominent objects that users cannot easily ignore, and experiments in this vein would allow closer examination

of object-based theories of visual attention. In addition, different types of interruptions should be examined. Interruptions may not come only from without. Many news sites offer links to additional content with many stories; some have slideshows pop up, audio files play, or windows with external links from the story appear. In an effort to include explanatory multimedia content on their sites, news providers may be causing unintended effects on memory and attitudes toward the site's content, and these effects should be explored.

The area of online interruptions is rich with possibilities for future study because someone always wants to find a bigger, better way to catch users' attention. These studies show that interruptions in the form of pop-up advertisements do affect users' memory and attitudes in some ways. The effects of interruptions are not universally bad or good, but that valence often depends on the point of view. Multiple providers may operate at once — a news organization and advertiser, for example — and users may have different motivations that affect how they process information. As people do more with machines, the opportunities for interruptions and their stakeholders will increase, so determining whether an interruption is bad or good may not be as important as the fact that it is almost certain.

Table 1. Study 1 summary of hypotheses

	Hypothesis	Brief rationale	Finding
H1a	Users will recognize and recall simple interruptions better than complex interruptions.	Complex interruptions should require more resources to process than simple interruptions. As more information must be processed, more resources should be allocated to the encoding process (Lang, 2007), which limits resources for storage.	Not supported
H1b	Users will recognize and recall complex interruptions better than simple interruptions.	People exert more effort when under greater cognitive load (Kahneman, 1973), so they may remember more about complex interruptions.	Not supported
H2	Interruptions in the middle of a story will lead to worse recognition and recall for both the interruption and the story compared to interruptions at the beginning or end.	Interruptions in the middle of a task disrupt people more than those at the beginning (Coraggio, 1990; Speier, 1996). People may be less attentive after interruption.	Not supported
H3	Interruptions in the middle of a story will lead to more time spent on the primary task compared to interruptions at the beginning or end.	People return to primary tasks more quickly after interruptions at the beginning rather than the middle or end (Czerwinski et al., 2000; Monk et al., 2002; Xia & Sudharshan, 2002). People must reorient to the primary task, which should increase the amount of time spent on it.	Not supported
H4	Users will have more negative attitudes toward complex interruptions than simple interruptions.	Interruptions are often seen as intrusive, which causes feelings of irritation (Edwards et al., 2002). As the amount of processing effort that people must perform increases, reactance may increase (Kalyanaraman, in press), so complex interruptions may elicit more negative attitudes than simple interruptions.	Not supported

H5	Users will have more negative attitudes toward late interruptions than earlier ones.	Interruptions are intrusive (Edwards et al., 2002), and late interruptions cause users to spend more time on task (Czerwinski et al., 2000; Monk et al., 2002; Xia & Sudharshan, 2002). Users are likely to resent added demands on their time and display more negative attitudes toward late interruptions.	Not supported
H6	Users will have more negative attitudes toward the Web site for complex interruptions than they will for simple interruptions.	Interruptions decrease satisfaction with the process and experience of a task (Xia & Sudharshan, 2002), and users may blame Web sites for the interruption (see Kalyanaraman, in press). An interruption that requires greater and immediate effort should exert a greater sense of intrusion, which may lead to more negative affect (Edwards et al., 2002).	Not supported
H7	Users will have more negative attitudes toward the Web site for late interruptions than earlier ones.	Users are likely to view Web sites as the generators of interruptions and blame them for disrupting the experience (see Kalyanaraman, in press). Late interruptions cause users to spend more time on task (Czerwinski et al., 2000; Monk et al., 2002; Xia & Sudharshan, 2002), and users may resent this demand on their time.	Not supported
H8	Users will have better memory for story content when they encounter simple interruptions that occur late in the task than when complex interruptions occur late.	Breaks between subtasks do not decrease workload when breaks occur late in the overall task (Bailey & Iqbal, 2008). When people are interrupted at a point of high memory load, they have a difficult time reorienting to the primary task (Bailey et al., 2001). Complex tasks require greater cognitive effort (Coraggio, 1990), so complex interruptions will add a heavier load when they occur late in the task, when cognitive load is already high.	Not supported
H9	Users will have more negative attitudes toward complex interruptions that occur late in the task than toward simple interruptions that occur late.	The intrusion of the interruption (Edwards et al., 2002) may cause more resentment when users perceive it to be an additional burden (Xia & Sudharshan, 2002). When users are focused on finishing a story and have the end in sight, they may react more negatively to a complex interruption that they will perceive as an additional burden.	Not supported

Table 7. Study 2 summary of hypotheses

	Hypothesis	Brief rationale	Finding
H1a	Users will recognize and recall simple interruptions better than complex interruptions.	Complex interruptions should require more resources to process than simple interruptions. As more information must be processed, more resources should be allocated to the encoding process (Lang, 2007), which limits resources for storage.	Not supported
H1b	Users will recognize and recall complex interruptions better than simple interruptions.	People exert more effort when under greater cognitive load (Kahneman, 1973), so they may remember more about complex interruptions.	Not supported
H2	Interruptions in the middle of a story will lead to worse recognition and recall for both the interruption and the story compared to interruptions at the beginning or end.	Interruptions in the middle of a task disrupt people more than those at the beginning (Coraggio, 1990; Speier, 1996). People may be less attentive after interruption.	Not supported
H3	Interruptions in the middle of a story will lead to more time spent on the primary task compared to interruptions at the beginning or end.	People return to primary tasks more quickly after interruptions at the beginning rather than the middle or end (Czerwinski et al., 2000; Monk et al., 2002; Xia & Sudharshan, 2002). People must reorient to the primary task, which should increase the amount of time spent on it.	Not supported
H4	Users will have more negative attitudes toward complex interruptions than simple interruptions.	Interruptions are often seen as intrusive, which causes feelings of irritation (Edwards et al., 2002). As the amount of processing effort that people must perform increases, reactance may increase (Kalyanaraman, in press), so complex interruptions may elicit more negative attitudes than simple interruptions.	Not supported

H5	Users will have more negative attitudes toward late interruptions than earlier ones.	Interruptions are intrusive (Edwards et al., 2002), and late interruptions cause users to spend more time on task (Czerwinski et al., 2000; Monk et al., 2002; Xia & Sudharshan, 2002). Users are likely to resent added demands on their time and display more negative attitudes toward late interruptions.	Not supported
H6	Users will have more negative attitudes toward the Web site for complex interruptions than they will for simple interruptions.	Interruptions decrease satisfaction with the process and experience of a task (Xia & Sudharshan, 2002), and users may blame Web sites for the interruption (see Kalyanaraman, in press). An interruption that requires greater and immediate effort should exert a greater sense of intrusion, which may lead to more negative affect (Edwards et al., 2002).	Not supported
H7	Users will have more negative attitudes toward the Web site for late interruptions than earlier ones.	Users are likely to view Web sites as the generators of interruptions and blame them for disrupting the experience (see Kalyanaraman, in press). Late interruptions cause users to spend more time on task (Czerwinski et al., 2000; Monk et al., 2002; Xia & Sudharshan, 2002), and users may resent this demand on their time.	Not supported
H8	Users will have better memory for story content when they encounter simple interruptions that occur late in the task than when complex interruptions occur late.	Breaks between subtasks do not decrease workload when breaks occur late in the overall task (Bailey & Iqbal, 2008). When people are interrupted at a point of high memory load, they have a difficult time reorienting to the primary task (Bailey et al., 2001). Complex tasks require greater cognitive effort (Coraggio, 1990), so complex interruptions will add a heavier load when they occur late in the task, when cognitive load is already high.	Not supported
H9	Users will have more negative attitudes toward complex interruptions that occur late in the task than toward simple interruptions that occur late.	The intrusion of the interruption (Edwards et al., 2002) may cause more resentment when users perceive it to be an additional burden (Xia & Sudharshan, 2002). When users are focused on finishing a story and have the end in sight, they may react more negatively to a complex interruption that they will perceive as an additional burden.	Not supported

H10a	As story length increases, recognition and recall for the story will decrease.	Subprocesses draw from a limited pool of resources (Bettman, 1979; Lang, 2007), and short stories will require fewer resources allocated to the encoding subprocess. This frees resources for storage and retrieval.	Not supported
H10b	As story length increases, recognition and recall for the story will increase.	Even though longer stories present more information to process, people may exert more effort when facing greater demands on cognitive resources (Kahneman, 1973).	Not supported
H11a	As story length increases, users will have more positive attitudes toward interruptions.	Interruptions may reduce task performance, but people may appreciate them for task-related stress relief (Coraggio, 1990).	Not supported
H11b	As story length increases, users will have more negative attitudes toward interruptions.	People often appreciate interruptions during tasks with many subtasks (Coraggio, 1990), but reading is not such a task. People may find reading a long story tedious and simply want to finish the task, and anything that increases the amount of time they must spend on it may be perceived negatively.	Not supported

APPENDIX A

PRE-TEST QUESTIONNAIRE

These questions refer to the story about gender differences in math skills and the pop-up advertisement for Texas Instruments. Please think about that content and answer these five questions.

How interested were you in the story about gender differences in math skills?

Uninterested Interested

• • • • • • •

How familiar to you was the information in the story about gender differences in math skills?

Unfamiliar Familiar

• • • • • • •

How involved did you feel in the story about gender differences in math skills?

Uninvolved Involved

• • • • • • •

How familiar to you is the brand Texas Instruments?

Unfamiliar Familiar

• • • • • • •

How relevant was the Texas Instruments pop-up ad to the story about gender differences in math skills?

Relevant Irrelevant

• • • • • • •

These questions refer to the story about obesity and the pop-up advertisement for Alli. Please think about that content and answer these five questions.

How interested were you in the story about obesity?

Uninterested Interested

• • • • • • •

How familiar to you was the information in the story about obesity?

Unfamiliar Familiar

• • • • • • •

How involved did you feel in the story about obesity?

Uninvolved Involved

• • • • • • •

How familiar to you is the brand Alli?

Unfamiliar Familiar

• • • • • • •

How relevant was the Alli pop-up ad to the story about obesity?

Relevant Irrelevant

• • • • • • •

These questions refer to the story about phone options and the pop-up advertisement for Sprint. Please think about that content and answer these five questions.

How interested were you in the story about phone options?
Uninterested Interested
• • • • • • •

How familiar to you was the information in the story about phone options?
Unfamiliar Familiar
• • • • • • •

How involved did you feel in the story about phone options?
Uninvolved Involved
• • • • • • •

How familiar to you is the brand Sprint?
Unfamiliar Familiar
• • • • • • •

How relevant was the Sprint pop-up ad to the story about phone options?
Relevant Irrelevant
• • • • • • •

These questions refer to the story about e-commerce and the pop-up advertisement for Overstock.com. Please think about that content and answer these five questions.

How interested were you in the story about e-commerce?
Uninterested Interested
• • • • • • •

How familiar to you was the information in the story about e-commerce?
Unfamiliar Familiar
• • • • • • •

How involved did you feel in the story about e-commerce?
Uninvolved Involved
• • • • • • •

How familiar to you is the brand Overstock.com?
Unfamiliar Familiar
• • • • • • •

How relevant was the Overstock.com pop-up ad to the story about e-commerce?
Relevant Irrelevant
• • • • • • •

What is your gender?
Male
Female

APPENDIX B

STIMULUS MATERIALS

Holiday online sales drop, but Internet shopping here to stay

Dan Kuhlmeier

Despite a record-breaking start to the holiday shopping season, online sales dropped in December for the first time. E-commerce still seems to be the growing trend in business, though.

The Monday after Thanksgiving was the second-heaviest online spending day on record, said Internet tracking firm comScore, behind only Dec. 10, 2007. Online sales climbed to $846 million, up 15 percent from the previous year.

Although online sales had been expected to be flat in the 2008 holiday season, they posted a 3 percent decline from a year ago, according to comScore. This was the first November-December decline for e-commerce.

Overall, though, Internet commerce continues its robust growth, defying a sluggish economy, Google's chief economist and several analysts said Friday.

Electronic commerce has grown about 22 percent in the last two years, said Hal Varian, the economist, who spoke at a forum on the state of the Internet economy at Google's new Washington office.

"The lesson here is that the economic slowdown is not an Internet slowdown," Varian said. "The Internet is looking pretty strong compared to other sectors."

Online spending is expected to rise a robust 17 percent this year, despite a sluggish economy that has bruised many brick-based retailers.

Retail sales online, excluding travel purchases, are set to grow to $204 billion in 2009 from $174.5 billion last year, fueled by sales of apparel, computers and autos, according to a survey conducted by Internet analysis firm Forrester Research. That projection is below the 21 percent increase seen in the prior year, but industry officials attribute it to the maturing of the business, not the sluggish economy.

E-commerce may be maturing, but it’s still attracting many new businesses. Many small

businesses are asking about e-commerce now, said Tim Sweet, sales manager for Consolidated Communications Inc. in Philadelphia. Consolidated builds Web and e-commerce sites for businesses, including setting up "shopping cart" and payment systems. Costs range from $6,000 to $40,000, depending on complexity.

Businesses who resist establishing an online sales presence often argue that customers need to see and feel many types of products before being confident to buy them, said Urvish Vashi, general manager of dedicated hosting at The Planet, a Houston-based Web hosting company.

Vashi said companies need to think about e-commerce as a complement to, not a replacement for, the traditional store.

As e-commerce builds steadily, physical retail space vacancies have been rising nationally, in cities like Dallas and Raleigh.

In Dallas, the retail vacancy rate was up from 6.4 percent in 2003 to 9 percent at the end of last year. In Raleigh, N.C., retail vacancy increased 7 percent in the last five years.

Many retailers are consolidating, but while stores are expensive to run they're often vital, said Roger Selbert, a retail trends expert from Santa Monica, Calif.

Most retailers' online supply chains largely reflect their brick-and-mortar operations, said Brian Kilcourse, senior vice president of retail operations at the National Retail Federation. But that's changing as companies see savings from having fewer fixed assets in trucks and warehouses, more flexibility in transportation, lower inventory carrying costs and less costly handling processes.

Although online retail accounts for just 3.4 percent of all retail sales, according to the Commerce Department, its weight in the retail space is almost certainly much greater, Kilcourse said.

One thing that helped online shopping take off was the lack of sales tax on most Internet purchases. However, the era of taxless Internet shopping could be ending. Pressure from cash-starved states and repercussions from a court decision in New York last week could soon lead to prevalent sales taxes for online purchases.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best deals in one place!
Furniture
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Bedding
Clothing & Shoes
Jewelry & Watches
Electronics
Sports
Books
Rated #2 for customer service.
Now shipping internationally.
Red Line Deals and clearance items every week.

Landlines dwindle as consumers choose mobile, online phones

Marc Dorsey

About one-quarter of Americans have cut the phone cords at their homes in favor of mobile phones and Internet technology, a new report showed.

Of cell phone customers, 27 percent say they have replaced their landlines with mobile phones for daily calling, according to a new survey from J.D. Power and Associates survey.

Most of those people — 61 percent — have disconnected landline service, while the rest keep but don't actively use their wired connections for calls, the study found.

"As the younger generation matures, those who grew up with cellular see no reason spending money on duplicative devices," said John Walls, spokesman for a wireless industry group.

The economic downturn adds a new factor to the decision to go all-wireless. As consumers cut spending, they'll take a close look at Internet access, pay-TV and phone services, says Thomas Wehmeier, an analyst at U.K.-based research firm Informa.

The big question is how many budget-conscious users might switch to wireless-only because of the economy, analysts say. Lower-income consumers, especially those without children at home, are most likely to cut the cord, analysts say.

Another cost-conscious option is using online phone services, known as Voice over Internet Protocol or VoIP.

Over the next three years, the Telecommunications Industry Association predicts the use of VoIP will grow 20 percent annually within the United States. That would bring the number of VoIP users nationwide to about 33.2 million in 2011, compared to 15.9 million users in 2007, according to the TIA's 2008 review and forecast.

April Murphy, who lives in Mountainview, Calif., has five siblings living overseas and frequently calls from her computer to theirs using the online service Skype.

"If I didn't have to have a landline for business, I would probably get rid of it, just because between Skype and our cell phone, I can't imagine having a real reason to need it," Murphy said.

Bill Kula, a spokesman with Verizon Communications Inc., said the company is experiencing an 8 percent to 9 percent decrease per year in landline phones. But he said the traditional landline has a future in the home telecommunications mix. Surveys show

customers like the reliability of a landline and the security of knowing it has full emergency 911 capabilities.

"The wired telephone is not going away with the dinosaur," Kula said. "It will continue to be a versatile part of the society for decades to come."

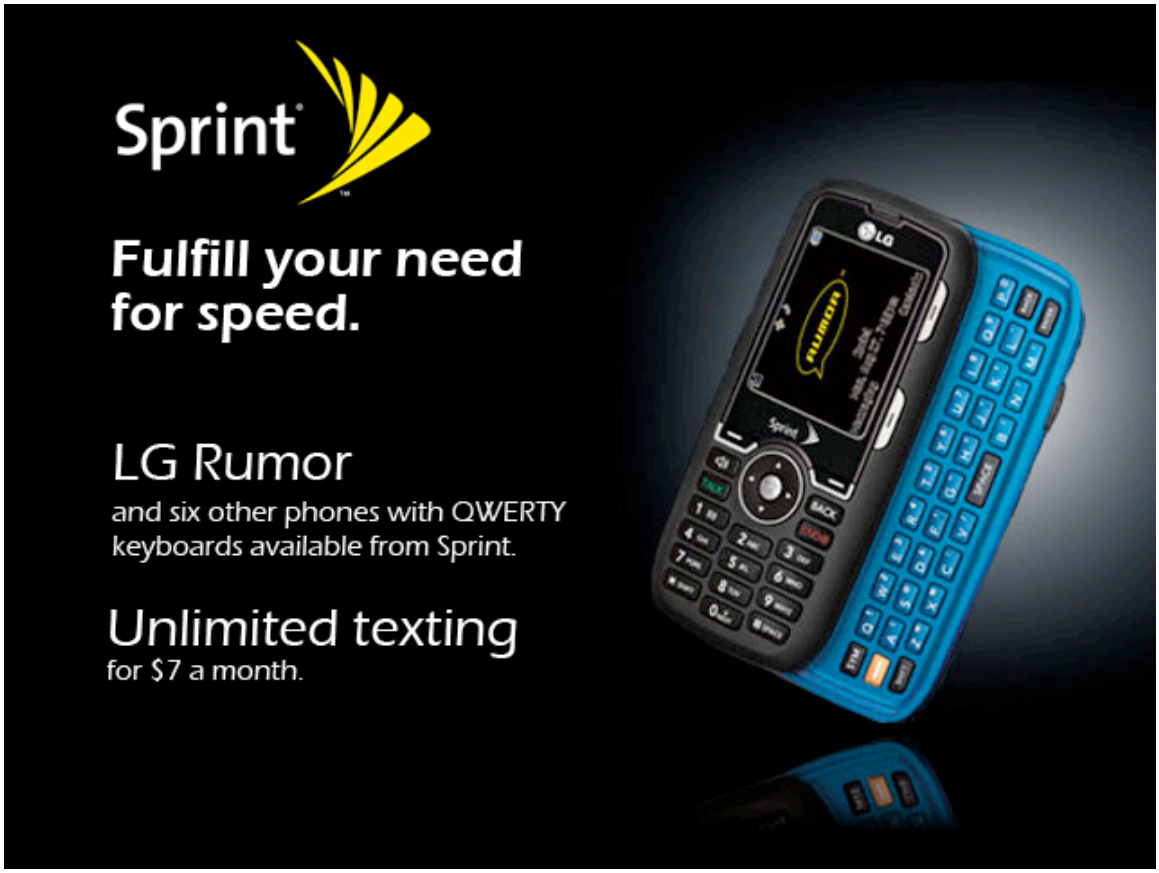
Landline customers like Mary Beth Langes of Austin, Texas, keep their phones for reasons that mix of tradition and nostalgia.

“I moved to Austin when I was 22,” she said. “I’m 54 now, and I’ve had the same phone number since the day I arrived. I can’t give that up now, even though most of the calls I get on the home phone are from telemarketers. People don’t want to play phone tag, so they just call my cell, which is always with me.”

If keeping a time-honored land line number is what is holding people back from going cellular-only, T-Mobile has a new plan that will allow users to keep their home phone service while giving up the home phone bill.

For $10 a month, T-Mobile will be "delivering the traditional features of a landline service," along with cell phone features, T-Mobile CEO Bob Dotson said in a statement.

Such plans may alleviate issues with dropping their home phones. Ten percent of cord-cutting customers return to landlines, a Nielsen Mobile study said last month. This occurs because people need them to connect to other services or devices such as a security system, a fax machine or pay-per-view TV.


Sprint
Fulfill your need for speed.
LG Rumor
and six other phones with QWERTY keyboards available from Sprint.
Unlimited texting
for $7 a month.

Obesity epidemic may have no easy answers

Sophie Canfield

A recent study shows that at least two-thirds of Americans are overweight or obese, and scientists say conventional wisdom about diet and exercise may not be enough to help people fight extra weight.

The Centers for Disease Control and Prevention in Atlanta reported that more than 66 percent of Americans are overweight or obese. The risk of obesity is growing in every group of Americans except for the number of obese women, which is stable at 33 percent.

“Many people are conscious of the weight they are gaining and want to become healthier, but that desire doesn’t seem to reduce the growing trend of obesity,” said Max Higgins, director of health statistics at the CDC.

Diet has been a scapegoat as the nation gets fatter, and many schools have banned sale of junk food and sodas to students. New York and other cities now require restaurants to disclose calorie information on their menus.

Exercise has been emphasized more, as well. The government recommended 30 minutes of daily exercise in the 1970s. Guidelines in 2005 increased the recommendation to 60 to 90 minutes of moderate exercise each day.

But now scientists are saying that changing diet and exercise may not be enough. Many of the so-called facts about obesity, they say, amount to speculation or oversimplification of the medical evidence. Diet and exercise matter, they now know, but these influences alone do not determine an individual’s weight. Body composition also is dictated by DNA and monitored by the brain. Bypassing these physical systems is not just a matter of willpower.

“There are physiological mechanisms that keep us from losing weight,” said Matthew W. Gilman, the director of the obesity prevention program at Harvard Medical School/Pilgrim Health Care.

Gilman is among scientists who say that each individual has a genetically determined weight range spanning perhaps 30 pounds. Those who force their weight below nature’s preassigned levels become hungrier and eat more; studies also show that their metabolisms slow as the body tries to conserve energy and regain weight. People trying to exceed their weight range face the opposite situation: eating becomes unappealing, and their metabolisms shift into high gear.

Even exercise can’t always conquer this internal weight range. For example, a 20-minute walk burns about 100 calories — which is less than people estimate they are burning, said

Madelyn Fernstrom, director of the weight-management center at the University of Pittsburgh Medical Center.

But people who commit to a daily 20-minute walk should be able to lose a pound every 35 days since there are 3,500 calories in a pound, right?

Wrong, says Jeffrey Friedman, an obesity researcher at Rockefeller University. Counting calories is an imprecise art, so people often consume more than they mean to. And the brain's internal calorie counters are always active. Even strong-willed dieters make up for calories lost on one day with just a few small, extra bites the next day.

"The system operates with 99.6 percent precision," Friedman said.

The system seems to develop before birth. Friedman pointed to several animal studies that show a mother's diet during pregnancy may affect her offspring's weight through the years. Human studies have shown that women who eat little while pregnant are more likely to have children who grow into obese adults. The same is true for mothers who smoke during pregnancy, other studies show.

"I would never say that people bear no responsibility for their weight," Friedman said. "But the evidence of all the genetic factors out of our control gives me a reason to stop beating myself up too much when I weigh more than I should."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weight-loss plan
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effective
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APPENDIX C

QUESTIONNAIRE

Please look at the card with a handwritten number taped to the top of your monitor. Type that number in the space below.

We're measuring your browsing experience. You are not being tested, so please answer ALL questions to the best of your ability.

The next questions refer to the story about landlines, cell phones, and online phone services.

About what percentage of Americans have dropped landline phone service at home?

- 5%
- 10%
- 25%
- 50%

What VoIP service does April Murphy use to call her five siblings overseas?

Several groups are most likely to discontinue landline service. Which is NOT one of those groups?

- young users
- low income
- baby boomers
- people who grew up with cell phones

What phone company says landline phone subscriptions are falling 8% to 9% each year?

How familiar are you with the topic of this story?

Not at all familiar Very familiar

• • • • • • •

The content of this story said something important to me.

Strongly disagree Strongly agree

• • • • • • •

The content of this story was meaningful for me.

Strongly disagree Strongly agree

• • • • • • •

This story talked about something that concerned me

Strongly disagree Strongly agree

• • • • • • •

The next questions refer to the story about e-commerce.

Online sales from the Monday after Thanksgiving increased how much over last year?

- 1%
- 5%
- 15%
- 30%

In the current economic slowdown, Internet sales look _____ compared to other sectors.

- Weak
- About the same
- Strong
- Nonexistent

Name ONE city where the retail space vacancies have increased in the last five years.

In general terms, how did holiday online sales perform in 2008 compared to the year before? (One or two word answer is fine)

How familiar are you with the topic of this story?

Not at all familiar Very familiar

• • • • • • •

The content of this story said something important to me.

Strongly disagree Strongly agree

• • • • • • •

The content of this story was meaningful for me.

Strongly disagree Strongly agree

• • • • • • •

This story talked about something that concerned me

Strongly disagree Strongly agree

• • • • • • •

The next questions refer to the story about obesity in America.

About what percentage of Americans is overweight or obese?

- 25%
- 33%
- 50%
- 66%

Current guidelines (from 2005) recommend how many minutes of exercise each day?

- 10-20
- 30-45
- 60-90
- 90-120

A 20-minute walk burns how many calories?

Each person has a genetically determined weight range spanning about how many pounds?

How familiar are you with the topic of this story?

Not at all familiar Very familiar

• • • • • • •

The content of this story said something important to me.

Strongly disagree Strongly agree

• • • • • • •

The content of this story was meaningful for me.

Strongly disagree Strongly agree

• • • • • • •

This story talked about something that concerned me.

Strongly disagree Strongly agree

• • • • • • •

The next questions refer to the pop-up advertisements you saw while you were reading the stories on Focus News.

What was the name of the weight-loss drug advertised in a pop-up ad?

What was the name of the cell phone company advertised in a pop-up ad?

What was the name of the online-only retailer advertised in a pop-up ad?

The weight-loss drug Alli is approved by the FDA.

- True
- False

According to the Sprint pop-up ad, unlimited texting with Sprint cost how much monthly?

- $5
- $7
- $10
- $13

Overstock.com has been rated _____ for customer service.

- #1
- #2
- #3
- Not mentioned

Please answer the following questions pertaining to the pop-up advertisements that appeared on the Web page.

This section pertains to an overall evaluation of the ad for OVERSTOCK.COM based on the following scales. Notice that some of the scales are reversed. So please read both ends of the scale carefully before making your choice.

Appealing • • • • • • • Unappealing

Informative • • • • • • • Uninformative

Unexciting • • • • • • • Exciting

Boring • • • • • • • Interesting

Good • • • • • • • Bad

Pleasant • • • • • • • Unpleasant

Dull • • • • • • • Dynamic

Clear • • • • • • • Confusing

Unattractive • • • • • • • Attractive

Favorable • • • • • • • Unfavorable

Likable • • • • • • • Dislikable

Ordinary • • • • • • • Sophisticated

Persuasive • • • • • • • Unpersuasive

Low quality • • • • • • • High quality

Important • • • • • • • Unimportant

Irrelevant • • • • • • • Relevant

Involving • • • • • • • Uninvolving

Unneeded • • • • • • • Needed

For the next section of the questionnaire, please mark the choice that best describes your opinions.

I barely looked at the content of the OVERSTOCK.COM ad.
Strongly disagree • • • • • • • Strongly agree

I paid a great deal of attention to the OVERSTOCK.COM ad.
Strongly disagree • • • • • • • Strongly agree

How familiar are you with the OVERSTOCK.COM ad that appeared on the computer screen?
Not at all familiar Very familiar

• • • • • • •

Have you ever shopped on the Overstock.com Web site before?

- Yes
- No

For each statement below, please mark the choice on the scale that best describes your opinions.

I am likely to try products from the OVERSTOCK.COM Web site.

Strongly disagree Strongly agree

• • • • • • •

I am likely to buy products from the OVERSTOCK.COM Web site.

Strongly disagree Strongly agree

• • • • • • •

This section pertains to an overall evaluation of the ad for SPRINT based on the following scales. Notice that some of the scales are reversed. So please read both ends of the scale carefully before making your choice.

Appealing Unappealing

• • • • • • •

Informative Uninformative

• • • • • • •

Unexciting Exciting

• • • • • • •

Boring Interesting

• • • • • • •

Good Bad

• • • • • • •

Pleasant Unpleasant

• • • • • • •

Dull Dynamic

• • • • • • •

Clear Confusing

• • • • • • •

Unattractive Attractive

• • • • • • •

Favorable Unfavorable

• • • • • • •

Likable Dislikable

• • • • • • •

Ordinary Sophisticated

• • • • • • •

Persuasive Unpersuasive

• • • • • • •

Low quality High quality

• • • • • • •

Important Unimportant

• • • • • • •

Irrelevant Relevant

• • • • • • •

Involving Uninvolving

• • • • • • •

Unneeded Needed

• • • • • • •

For the next section of the questionnaire, please mark the choice that best describes your opinions.

I barely looked at the content of the SPRINT ad.

Strongly disagree Strongly agree

• • • • • • •

I paid a great deal of attention to the SPRINT ad.

Strongly disagree Strongly agree

• • • • • • •

How familiar are you with the SPRINT ad that appeared on the computer screen?

Not at all familiar Very familiar

• • • • • • •

Have you ever used Sprint cell phone service before?

- Yes
- No

For each statement below, please mark the choice on the scale that best describes your opinions.

I am likely to try the product featured in the SPRINT ad.

Strongly disagree Strongly agree

• • • • • • •

I am likely to buy the product featured in the SPRINT ad.

Strongly disagree Strongly agree

• • • • • • •

This section pertains to an overall evaluation of the ad for ALLI based on the following scales. Notice that some of the scales are reversed. So please read both ends of the scale carefully before making your choice.

Appealing Unappealing

• • • • • • •

Informative Uninformative

• • • • • • •

Unexciting Exciting

• • • • • • •

Boring Interesting

• • • • • • •

Good Bad

• • • • • • •

Pleasant Unpleasant

• • • • • • •

Dull Dynamic

• • • • • • •

Clear Confusing

• • • • • • •

Unattractive Attractive

• • • • • • •

Favorable Unfavorable

• • • • • • •

Likable Dislikable

• • • • • • •

Ordinary Sophisticated

• • • • • • •

Persuasive Unpersuasive

• • • • • • •

Low quality High quality

• • • • • • •

Important Unimportant

• • • • • • •

Irrelevant Relevant

• • • • • • •

Involving Uninvolving

• • • • • • •

Unneeded Needed

• • • • • • •

For the next section of the questionnaire, please mark the choice that best describes your opinions.

I barely looked at the content of the ALLI ad.

Strongly disagree Strongly agree

• • • • • • •

I paid a great deal of attention to the ALLI ad.

Strongly disagree Strongly agree

• • • • • • •

How familiar are you with the ALLI ad that appeared on the computer screen?

Not at all familiar Very familiar

• • • • • • •

Have you ever used Alli before?

- Yes
- No

For each statement below, please mark the choice on the scale that best describes your opinions.

I am likely to try the product featured in the ALLI ad.

Strongly disagree Strongly agree

• • • • • • •

I am likely to buy the product featured in the ALLI ad.

Strongly disagree Strongly agree

• • • • • • •

Please mark the choice that best describes your opinions about the THREE ADS in general.

I found the ads to be complex.

Strongly disagree Strongly agree

• • • • • • •

I found it difficult to close the ads.

Strongly disagree Strongly agree

• • • • • • •

I found it frustrating trying to navigate through the ads.

Strongly disagree Strongly agree

• • • • • • •

This section of the questionnaire asks you to report your media use and preferences.

How many days of the week, if any, do you read a newspaper (including online newspaper)?

0 1 2 3 4 5 6 7

• • • • • • • •

How many newspapers (including online newspapers) do you read regularly?

Number of newspapers _____

Please list any newspapers you read regularly online.

Please list any news sites (other than newspapers) that you regularly visit and read online.

On average, how many minutes a day do you spend browsing the Web, not including checking your e-mail? Please report the total in minutes.

Minutes of Web browsing daily _____

Have you ever bought anything online?

- Yes
- No

How often do you make online purchases?
Number of times per month _____

This section assesses your general perceptions of the Focus News Web site you just visited.

Please rate your level of agreement with the following statements on a scale from "strongly disagree" on the left to "strongly agree" on the right.

This Web site makes it easy for me to build a relationship with this company.
Strongly disagree Strongly agree
• • • • • • •

I would like to visit this Web site again in the future.
Strongly disagree Strongly agree
• • • • • • •

I'm satisfied with the service provided by this Web site.
Strongly disagree Strongly agree
• • • • • • •

I feel comfortable in surfing this Web site.
Strongly disagree Strongly agree
• • • • • • •

I feel surfing this Web site is a good way for me to spend my time.
Strongly disagree Strongly agree
• • • • • • •

Compared with other news Web sites, I would rate this one as one of the best.
Strongly disagree Strongly agree
• • • • • • •

I like the Web site.
Strongly disagree Strongly agree
• • • • • • •

How familiar are you with the Focus News site that you just viewed?
Strongly disagree Strongly agree
• • • • • • •

I would trust information on the Focus News site.
Strongly disagree Strongly agree
• • • • • • •

I believe the Focus News Web site to be credible.
Strongly disagree Strongly agree
• • • • • • •

I found the stories featured on the Focus News Web site to be of high quality.
Strongly disagree Strongly agree
• • • • • • •

I found the stories featured on the Focus News Web site to be accurate.
Strongly disagree Strongly agree
• • • • • • •

I found the stories featured on the Focus News Web site to be reliable.
Strongly disagree Strongly agree
• • • • • • •

I found the stories featured on the Focus News Web site to be believable.
Strongly disagree Strongly agree
• • • • • • •

The content of the Focus News Web site made it interactive.
Strongly disagree Strongly agree
• • • • • • •

The way the Focus News Web site was designed made it interactive.
Strongly disagree Strongly agree
• • • • • • •

Finally, please report some information about yourself.

Your gender is:
- Male
- Female

Your major is: _____

Your year in school:
- Freshman
- Sophomore
- Junior
- Senior
- Graduate student

Your age in years: _____

APPENDIX D

INFORMED CONSENT

University of North Carolina-Chapel Hill
Consent to Participate in a Research Study
Adult Participants
Social Behavioral Form

IRB Study #09-0211
Consent Form Version Date: January 26, 2009

Title of Study: Browsing the News

Principal Investigator: Jessica Smith
UNC-Chapel Hill Department: School of Journalism and Mass Communication
UNC-Chapel Hill Phone number: 919-843-5795
Email Address: smithjes@unc.edu
Faculty Advisor: Dr. Sriram Kalyanaraman

Study Contact telephone number: 919-843-5795
Study Contact email: smithjes@unc.edu

What are some general things you should know about research studies?
You are being asked to take part in a research study. To join the study is voluntary. You may refuse to join, or you may withdraw your consent to be in the study, for any reason, without penalty.

Research studies are designed to obtain new knowledge. This new information may help people in the future. You may not receive any direct benefit from being in the research study. There also may be risks to being in research studies.

Details about this study are discussed below. It is important that you understand this information so that you can make an informed choice about being in this research study.

You will be given a copy of this consent form. You should ask the researchers named above, or staff members who may assist them, any questions you have about this study at any time.

What is the purpose of this study?
The purpose of this research study is to learn about how people process information when they are reading news online.
How many people will take part in this study?
If you decide to be in this study, you will be one of approximately 360 people in this research study.

How long will your part in this study last?
You will spend about 30 minutes participating in this study.

What will happen if you take part in the study?
You will visit a news Web site and read three pre-selected stories on the site. After you finish reading the stories, you will click on a link that will take you to an online questionnaire about the stories and site. Your part in the study is complete after responding to the questionnaire.

What are the possible benefits from being in this study?
Research is designed to benefit society by gaining new knowledge. You may not benefit personally from being in this research study.

What are the possible risks or discomforts involved from being in this study?
There are no known risks associated with this study. There may be uncommon or previously unknown risks. You should report any problems to the researcher.

How will your privacy be protected?
Your responses to the questionnaire are accessible only to the researcher. After all participants have completed the study, the researcher will compile all responses into a password-protected database. Your name will appear nowhere in the data. The consent form you are signing will be separate from your responses and will be kept in the researcher's locked office.

Participants will not be identified in any report or publication about this study. Although every effort will be made to keep research records private, there may be times when federal or state law requires the disclosure of such records, including personal information. This is very unlikely, but if disclosure is ever required, UNC-Chapel Hill will take steps allowable by law to protect the privacy of personal information. In some cases, your information in this research study could be reviewed by representatives of the University, research sponsors, or government agencies for purposes such as quality control or safety.

Will you receive anything for being in this study?
You will receive ½ hour of departmental research credit.

Will it cost you anything to be in this study?
There will be no costs for being in the study. You may choose not to be in the study or to stop being in the study before it is over at any time. This will not affect your class standing or grades at UNC-Chapel Hill. You will not be offered or receive any special consideration if you take part in this research.

What if you have questions about this study?
You have the right to ask, and have answered, any questions you may have about this research. If you have questions, or concerns, you should contact the researchers listed on the first page of this form.

What if you have questions about your rights as a research participant?
All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have questions or concerns about your rights as a research subject you may contact, anonymously if you wish, the Institutional Review Board at 919-966-3113 or by email to IRB_subjects@unc.edu.

- -

Title of Study: Browsing the News

Principal Investigator: Jessica Smith

Participant's Agreement:

I have read the information provided above. I have asked all the questions I have at this time. I voluntarily agree to participate in this research study.

_____ _____
Signature of Research Participant Date

_____
Printed Name of Research Participant

_____ _____
Signature of Research Team Member Obtaining Consent Date

_____
Printed Name of Research Team Member Obtaining Consent

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