2017-06-01

The Rise of the Listicle: Using Eye-Tracking and Signal Detection Theory to Measure This Growing Phenomenon

Jason Robert Freeman
Brigham Young University

The Rise of the Listicle: Using Eye-Tracking and Signal Detection Theory to Measure This Growing Phenomenon

Jason Robert Freeman

A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Master of Arts

Kevin John, Chair
Clark Callahan
Quint Randle

School of Communications

Brigham Young University

ABSTRACT

The Rise of the Listicle: Using Eye-Tracking and Signal Detection Theory to Measure This Growing Phenomenon

Jason Robert Freeman
School of Communications, BYU
Master of Arts

As online technology continues to progress, the modes of communication through which content can be shared have exponentially grown. These include advances in navigational options for presenting information and news online. Though the listicle has been around for centuries, the internet has proliferated its growth, as content producers rely on its structure as a vehicle for sharing information. This research shows that in the case of listicles, format had no direct effect on recall, however, participants who had a greater interest in the content showed significantly higher levels of memory sensitivity. This critical finding suggests that news outlets and content producers should concern themselves with ensuring that their content is interesting and relevant to their audience more so than worrying about whether the listicle is in clickable or scrollable form. This first attempt to examine listicles by comparing their navigational difference in terms of recall performance lays a framework for future research on listicles.

Keywords: listicle, user experience, native advertising, online navigation, visual communication, social media, signal detection theory, cognitive load

ACKNOWLEDGMENTS

I would first like to thank the excellent faculty at Brigham Young University who have helped me cultivate a love for learning and research. A special thanks to my committee members Dr. Callahan, Dr. Randle and Dr. John. They have been instrumental in helping me shape this thesis. A special thank you to Dr. John who served as an excellent mentor throughout my undergraduate and graduate years.

I would also like to thank my supportive wife, Ashley, who has taught me the importance of going after dreams. It is nice to be surrounded by so many wonderful faculty and family members who support and challenge me to be my best self.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1

INTRODUCTION

Brand management in the digital age brings with it a new set of challenges and opportunities. In an increasingly fragmented message environment, brands must strive to keep a consistent image through a host of online and traditional channels. The abundance of media choices has caused audiences to move away from mainstream media. Public attitudes toward the mainstream media are at an all-time low (Turcotte, York, Irving, Scholl, & Pingree, 2015). This shift in public trust, coupled with new digital technologies, has caused many news outlets to adapt the types of content they produce, as well as the channels through which they share news and information. Publishers' content is moving toward a bite-sized, highly visual type of layout that many refer to as snack-able or on-the-go type content. In other words, advertisers and journalists alike know that there is an endless supply of messages that compete for the attention of the consumer. Therefore, providing easily digestible information is critical.

So, what is a listicle? A general definition of a listicle is an article as a numbered list (Vijgen, 2014). Some made up examples of listicle titles include: "10 Things You Need to Do Before You Turn 30" or "5 Must-see Movies This Summer." The chances are, if you even occasionally use the Internet, you will have read or at least skimmed a few listicles. For the purposes of establishing a more specific definition that can be applied to the research at hand, listicles will be defined as an article that is numbered or listed in a bulleted manner (e.g. BuzzFeed). Each number or sub-headline presents information that is separate from other sub-headlines but cohesive with the overall theme and title of the listicle. Though listicle content has

exploded in popularity and use in recent years, little research has been done to examine the differences in content recall between various formats of listicles.

In the current online era, maintaining engaged audiences is more critical and more difficult than ever. Attracting new readership through interesting and relevant content is becoming increasingly important in order to break through the clutter. Mersey, Malthouse, and Calder (2010) observed, "It is essential to realize that there is more than one path to engagement and that the different paths are realized by offering different experiences, enabling a brand to differentiate itself from others." Advertisers and journalists will need to become increasingly aware of how to engage their audience in natural and relevant ways as consumers become increasingly agitated by poor practices.

Historically, there has been several shifts in the way that information is disseminated and presented in newspapers and magazines. There have been several evolutionary periods in the print medium, and we are currently experiencing the largest shift yet as more and more content moves online. As information becomes more readily available, tools for filtering and organizing information from a variety of sources will become more valuable.

Online environments provide a richer use of a wide range of design elements unavailable in static print forms (Chu et al., 2009). Sundar and Constantin (2004), further this point by emphasizing that news content is specifically tailored for the online space which "means a more planned, deliberate and dedicated use of Web technology's unique value-added aspects, such as interactivity, multi-modality, and navigability. Instead of simply 'telling' the news story to audience members, this kind of news 'interacts' with Web users" (p.1). In order to measure performance in terms of recall and memory sensitivity, this study relies on eye-tracking and

signal detection theory to compare the performance of two common types of online navigation for listicles, clickable and scrollable.

Though eye-tracking studies using online content have increased in popularity in recent years, Chu and colleagues (2009) described the gap in research in this area by saying “A wide array of options exist for designing and presenting digital stories; however, little is known about users’ navigation within online materials, and how users perceive different displays of the same information” (p. 31). New findings in this area will prove to be valuable in determining the practical implications that this information could provide practitioners.

CHAPTER 2

LITERATURE REVIEW

The Value of the List

Lists have served a function for organizing ideas and information since the time Moses was given the Ten Commandments (Garber, 2015). Though there has been an evolution from stone tablets to digital tablets, lists continue playing a vital role in organizing and sharing information. Konnikova (2013) discussed the benefits of lists in the Internet age. "In the current media environment, a list is perfectly designed for our brain. We are drawn to it intuitively, we process it more efficiently, and we retain it with little effort" (para. 7). However, this process of acquiring knowledge with "little effort" could also be the very weakness of the listicle. Konnikova (2013) acknowledges this by saying, "Faced with a detailed discussion of policies toward China or five insane buildings under construction in Shanghai, we tend to choose the latter bite-sized option, even when we know we will not be entirely satisfied by it" (para. 7). Dodson (2016) observed that listicles are a form of click bait and that they are used at the expense of journalistic values including accuracy, balance and fairness.

Although listicles are often written as entertainment, it should not be hastily concluded that they exist solely as a vehicle for sharing pictures of cats. Leonhardt (2015) defended the reputation of the listicle by saying:

> The list — or "listicle," journalistic jargon for the combination of list and article — gets a bad rap. It's often derided as a dumbed-down version of journalism that's meant to attract clicks and that eludes nuance…But lists aren't inherently silly…As easy as it may be to mock listicles, they're really no different from traditional articles, quotations,

> photographs, charts or statistics. They're an extremely useful tool of expression that can be used well or used poorly. (para. 1 & 7)

The uses of the listicle are diverse, and therein lies its strength. Though some writers may use the listicle poorly, others realize the strength of its malleable, yet organized structure.

Listicles and Journalism

One of the biggest challenges for modern day journalists is determining how much soft news as opposed to hard news they should make available to readers. The shift into a soft-news-filled online environment has brought with it several studies that have looked at recall among soft and hard news content. Merle and Craig (2012) found that international soft news was shown to yield greater recall than hard news. Though both types of news have their place, journalists will need to better learn how much soft news is too much, and how to appeal to the diverse needs of their audiences. Diversity of content and stories will keep a variety of audiences engaged and returning for information and stories. Merle and Craig (2012) also found that news surrounding the economy was better processed using soft-news human-interest stories, rather than just presenting facts and figures.

It is no secret that journalism as a profession has undergone significant changes in recent decades. Peterson (2015) suggests that journalists are involved more than ever in finding innovative ways to monetize their content and interact more collaboratively with advertisers. Content producers are adapting to the wants and needs of advertisers. But are organizations selling their souls based on the need to make money? Is content still the king and advertising only a secondary participant? As Schaudt (2009) concluded, "The question that needs to be explored is whether delivering readers the kind of content they seem to be clicking on is the best

course for journalism" (p. 24). Simply putting content out that will get clicks is not necessarily the right way forward and may be harmful to the reputation of a media outlet.

Consumer needs and expectations from news and media sources have evolved over time. Personalization and customization of content is becoming the gold standard in today's digital age. Gershon (2013) observed, "More and more companies are using the Internet to communicate and personalize the information exchange between the seller (or advertiser) and the end consumer" (p. 48). The value of offering engaging content in a variety of forms is not new; historically, we have seen several shifts in the way that content is formatted in magazines and newspapers. There have been several evolutionary periods in the print medium, and we are currently experiencing one of the largest shifts yet as many publishers work to have an established print and digital presence.

In March of 2009, the *Seattle Post-Intelligencer* announced that after 146 years of being in the newspaper business, it was going to take its content 100 percent online (Richman & James, 2009). While some corporations have moved to an online only strategy, many large newspapers still have print as well as an online presence. A challenge among all news organization is finding ways to monetize content. Gershon, (2013) observed that though newspapers have a higher number of younger readers today, people are getting used to receiving their news for free, rather than paying for a magazine or newspaper.

Historical Use of Listicles

Ongoing research at Northeastern University is looking at viral 19th century texts and the ways in which they were shared and re-distributed in a variety of newspapers and magazines. Throughout the course of this project, 2.7 million pages from nearly 500 newspapers have been analyzed, and researchers have found that about 650 articles were reprinted 50 times or more

(Peterson, 2015). These findings suggest that early networks existed in which content was passed around and shared between editors. Peterson (2015) observed, "Viral Texts researchers are less interested in the specifics of the stories than in the nature of the networks that spread them" (para. 3). While a great deal of content today is shared and dispersed by users through social media and other platforms, older networks were controlled by editors who shared and exchanged content that was published freely during the newspaper boom of the 1800s (Peterson, 2015). Peterson cites "The Fate of the Apostle" as an example of a listicle that was shared among newspaper editors and ultimately published in a quarter of the U.S. media outlets in the 1800s. This listicle described which of Jesus's followers were "run through the body with lance" or "stoned and then beheaded" (Peterson, 2015).

Cordell (2015) also observed that the listicle was commonly shared between editors of many early publications including the *Ashtabula Weekly Telegraph,* which republished a list of fourteen "Health Hints—Follies" on February 8, 1862. Regarding this article, Cordell (2015) suggests:

> This snippet exemplifies the listicle genre, which is often associated with popular content online in the early twenty-first century, but which is also common in nineteenth century newspapers. The 'Follies' piece is, on its face, quite conventional and unassuming, but it was one of the most widely reprinted newspaper snippets of the nineteenth century, appearing at least 136 times in newspapers and magazines between 1862 and 1899 (29–30).

Early viral listicles, including those cited above, strengthen the evidence that listicles were both used and shared long before the birth of the Internet.

Listicle and Layout

It could be argued that an entire newspaper is in some ways one big listicle. Each headline illustrates a different story or piece, but each is centered under the topic of news. Brown (1952) called his generation the generation of headline scanners, and information and its accuracy was "misconstrued because of the limitations of headlines" (p. 132). It is important to note that this observation was made over a half century ago, but this observation is still applicable to modern content consumption. Now more than ever, headlines and sub-headlines in listicles serve as a way of informing the public on general news and information. To Brown's concern, this shallow approach to news consumption may create challenges with the way complex issues are understood.

Visual presentation strategies in print media have evolved over time, but the value of using visual breaks in content has long been understood. Radder and Stempel (1942), examined the types and uses of headlines in print journalism and observed that "headlines are designed to give beauty to the printed page, making it attractive, tempting, and reliable" (146). Though there are many types of headlines and formats in existence today, the overall purpose of the headline is similar to that of a listicle in that it aids in synthesizing information as well as providing visual breaks in the content.

Understanding the history of newspaper content helps us gain a clearer understanding of where we have been, as well as where we may be headed. Step (1999) analyzed the content and layout of ten newspapers in 1964 against the same number of newspapers in 1999. The analysis found that pre-Watergate papers used far fewer images and crammed as many stories and as much text as they could onto each page. Fast forward thirty-five years and the papers had completely transformed into image heavy interactive stories.

Newspapers have also adapted in the way they present complex quantitative information using simplistic visual strategies. Utt and Pasternack (1993) looked at some of the major changes in content layout and information presentation strategies in newspapers from 1982 to1991. During this time frame, newspapers were certainly beginning to use more photos and drawings to illustrate and tell stories, but one of the biggest increases was the use of graphics. This was especially evident in the way each paper communicated hard news and quantitative information.

In the early 1980s George Rorick took a job with a new paper called *USA Today*, which pushed the newspaper into a new direction as far as layout and design. Pompelio and Rosen (2009) described the way that George Rorick was at the forefront of this evolution as he created a visual weather map of the U.S. that used less text, yet was packed with information. His pioneering efforts in visual communications with *USA Today* brought success to the paper as well as disruption to other papers that needed to follow suit and adapt. The Society of Newspaper Design found that production capabilities of daily newspapers grew from 40 to 90 percent between 1984 and 1988 (Utt & Pasternack, 1993; Pipps, Walter, Endres, & Tabatcher, 2009). Fast forward thirty years and it is evident that visual communication is at the heart of almost every major and minor news story.

The evolution of the newspaper has happened in a relatively short amount of time, and, as new technologies emerge, the evolution continues at an even faster rate. Listicles serve many of the same functions as early graphics in that they simplify and condense large amounts of information. Finding solutions for organizing pre-existing information, or even the aggregating of content, is critical in this new digital environment. The fact is that if it is not bite-sized, they may not bite it.

Like the early maps and graphics at *USA Today*, modern-day listicles have transformed the way information is consumed. But the list has been used historically as a way for sharing ideas and creating culture. In 2009, Der Speigel interviewed novelist Umberto Eco about establishing culture amongst chaos. Eco described the value of lists saying:

> The list doesn't destroy culture; it creates it. Wherever you look in cultural history, you will find lists. In fact, there is a dizzying array: lists of saints, armies and medicinal plants, or of treasures and book titles. Think of the nature collections of the 16th century. My novels, by the way, are full of lists (Beyer & Gorris, 2009, para. 4).

Though the listicle, by definition, is typically associated with journalistic content and may have a more recent history, it seems that its cousin, the list, has been used through history as a vehicle for creating culture.

Listicles and Magazines

Some of the earliest magazines in the United States were revolutionary in that they catered to a primarily female audience. The first American women's magazine was published in Philadelphia in 1792 and had to fend off accusations of indecency in order to sell and survive (Aronson, 2002). By the 1820s, women's magazines appeared in nearly every city and town large enough to have a printing press (Aronson, 2002). From the beginning, many women's magazines called upon users to submit favorite recipes, with the winners receiving cash prizes as well the opportunity to be published in the next issue. Today, we refer to this type of content production as user-generated content. Freeman (2016) found that early women's magazines often aggregated user generated content into a single listicle, but these listicles were often lengthy and lacked cohesion because they were authored by more than one person.

Limited research has been done surrounding user-generated content and its role in the early years of magazine publication. Aronson (2014) looked at the role of user-generated content in *Ladies Home Journal* and observed:

> Through roughly their first century, pioneering "ladies magazines" functioned in American culture as a democratizing force. Largely user-generated and perpetuated by reader response, they invited a range and promoted the exchange of audience voices and views—much like digital and social media today. (p. 313)

The exchange of voices as described by Aronson (2014) is something that many take for granted in today's online and social media era. Understanding the type of content that male and female readers submitted to these early magazines helps draw comparisons between what was happening then and what is happening now.

Sternadori (2013) argued that the inclusivity and interactivity of early magazines is much like the modern online culture of social media, blogs, and online commenting, where individuals act as both authors and readers. Though *Ladies Home Journal* has been around for over a century, the magazine announced in 2012 that it was going to completely socialize its content so that nearly all their content was user-generated (Aronson, 2014). This observation is critical in establishing that the current online social environment has not shifted us away from these earlier forms and practices in content production, but rather perpetuated them.

Like newspapers, magazines have seen a drastic evolution during the last century as visual presentation strategies have continued to simplify. Feasley and Stuart (1987) observed that between the 1930s, 1940s, and 1950s, magazines began using fewer type styles, fewer illustrations, and more succinct headlines. The 1960s were a time of creative revolution; this

gave rise to a more contemporary advertising and magazine design, the influence of which can still be seen today (Feasley & Stuart, 1987).

In recent years, magazines have been confronted with the challenge of deciding how to strategically offer their content online in a way that still allows for continued monetization (Kaiser & Kongsted, 2012). Many magazines offer some free content through social media and their own websites, but require a subscription for users to gain full access (Kaiser & Kongsted, 2012). Magazines must create a presence online as well as in print, which brings about increased logistical challenges.

Social Media as a Vehicle for News

While newspapers have evolved in presentation and practice, one thing has remained the same, the need to attract and keep readership to survive and thrive. In the online era, engagement and circulation are often measured in clicks. Social media has provided a new outlet for consumers to share as well as consume a variety of content types. Vijgen (2014) described the strength of listicles stating that “the key lies not only in the power of the format in and by itself, but also in 'shareable factors' that are related to the individual listicle” (p. 103).

Social media channels, such as Facebook, were started with the primary goal of connecting friends and family members online. However, it has also served as a content hub for brands and users to shares news and information. Pew Research (2014) found that 30 percent of U.S. adults are consuming news content on Facebook. The study by Turcotte and colleagues (2015) found that news stories shared on social media by opinion leaders increases the likelihood that individuals will seek future news information, as well as increasing overall trust in that news source.

Each social channel plays a very different role in disseminating and sharing information based on each platform's unique features. Josephson and Miller (2015) conducted an eye tracking study to observe differences in processing headlines on Facebook vs. Twitter. They found that using questions in a headline is more effective on Facebook than on Twitter. Twitter users are seeking quick bits of news information, while Facebook users are more engaged with content and willing to click through an article. Facebook content tends to be "fluff" content mixed with some news, while Twitter is used heavily for sharing current news and events (Josephson & Miller, 2015).

The Listicle as Aggregator

Establishing methods for organizing and synthesizing content in the current online and information age is critical. Internet users have been using online aggregators of information since the late 1990s using a Rich Site Summary (RSS) Feed, which essentially provides a user the ability to automatically gather a variety of sources into one place (Canavilhas & Satuf, 2015). More advanced platforms for online aggregating are emerging that allow users to specify personal interests and receive only information from pre-selected relevant sources. This process of organizing information into one place provides readers the ability to act as secondary filters, empowering the user.

Online aggregators are most effective when they connect with social platforms where users are already going to for information. Canavilhas and Satuf (2015) argued that these aggregating apps are valuable because they can assist in organizing the abundant amount of information available online. Content aggregators are able to interact with social media platforms in a variety of ways. Applications including Zite, Paper, Pulse, Feedly, and News360, can

enhance the interaction of Facebook and LinkedIn users by allowing them to save and organize information from one platform into another (Canavilhas & Satuf, 2015).

Just like these emerging aggregating apps and programs, the modern-day use of a hashtag provides the means for producers and users of content to find and share like information. Hashtags are used to link similar ideas, images, and information by using a commonly linked word or multiple words. Zappavigna (2015) made a similar observation regarding hashtags by arguing that the searchable and cumulative property of hashtags provides the possibility for new forms of social bonding.

A listicle can be seen as both an aggregator and organizer of content in that it typically provides a place where cohesive content and layout are consistent and convenient. The leader in the online listicle movement is BuzzFeed, an online channel that serves up a wide variety of listicle content (Lieb, 2015). In an email exchange with Adweek, BuzzFeed's chief editorial director Jack Shepard noted:

> First of all, I don't love the term 'listicle,' because a truly great list can be *so much more* than just an arbitrary grouping of similar things, which is what 'listicle' brings to mind . . .At their best, lists are just scaffolding for stories: The list format grabs the attention because it's an easy way for people to process information and for readers to know what they're getting, but that's not even close to half the battle. A great list that people share everywhere has to be an experience (Why listicles are here to stay, 2013, para. 4).

Just as social media networks and content aggregators are providing scaffolding for relevant news and information, listicles serve a similar function by housing like content under one roof.

Lists and Recall

Bulleted lists (i.e. recipes) have been shown to aid in people's ability to recall information. A study by Jansen (2014) found that, overall, bulleted content resulted in higher recall than content that was enumerated within a paragraph. One side-effect, however, was that the heightened recall of the bulleted content itself led to a lower recall in the content surrounding the key information. This finding could indicate that advertisements and other information surrounding listicles may be processed at a lower level than the primary content found in more traditional online articles. Jansen (2014) observed, "The effect of the list or enumeration is that the components evoke some larger set of which they are a part" (p. 146). This research attempts to extend this and similar studies that have looked at list layouts to determine best practices.

Listicles and Native Advertising

Online advertising and, in particular, banner advertisements have been studied in terms of placement (Razzouk & Seitz, 2002), design, effectiveness (Sang Yeal Lee & Yong-Suk Cho, 2010; Drèze & Hussherr, 2003), and recall (Razzouk & Seitz, 2002). One of the strengths of online advertising is its ability to provide instant metrics relating to consumer engagement. However, Consumers have become accustomed to banner advertisements and have naturally learned to divert their attention from them. The click through rates in 1996 were around 7%, but by 2002 had already declined sharply to 0.7%, as users became more wary (DoubleClick, 2003). The online space is cluttered with advertising and, as such, consumers are using avoidance strategies in order to minimize exposure to these messages (Chang-Hoan, & Hongsik, 2004).

To combat declining revenues, newer forms of advertising, including native advertising, are being used to seamlessly integrate sponsored messages into more editorial types of content

(Sheehan, 2016). Some scholars have raised questions regarding the influence of native advertising on larger issues of media commercialism (Carlson, 2015). Sheehan (2016) argued that the advertising industry should create advertising that adds value for the consumer and that effectively produced native advertising can do just that. Sheehan (2016) however, asserts that "most native advertising today is thinly veiled advertorial, or worse, advertising dressed up like content." Thus, native advertising benefits the consumer only if produced and placed in proper channels.

Gottfried (2014) suggests that native advertising intentionally causes confusion, ultimately "blurring the line between editorial and advertisement with the hopes that the advertisement becomes a credible source of information rather than, simply, an advertisement" (401). The use of native advertising is not only common in Buzzfeed listicles, but is often done through social media websites including Facebook, Twitter, and Instagram (Gottfried, 2014).

The legality of native advertising and the role of disclosure has been a recent topic of interest among scholars (Wojdynski & Evans, 2016). The FTC suggests that disclosures can be used to effectively mark a piece of content as advertising (Wojdynski & Evans, 2016). Wojdynski and Evans (2016), conducted a study to determine how well consumers were able to identify native advertising based on the placement of disclosure messages. Results indicated that less than 8% of participants recognized the content as an advertisement, and disclosures placed at the top of native content showed lower levels of recall than disclosers in the middle or at the end of an article (Wojdynski & Evans, 2016). More research is needed to understand the level of consumer awareness surrounding native advertising, but these initial studies indicate that consumers have a difficult time distinguishing between advertorial and native advertising.

Online Listicle Formats

Most news websites have a format derived from print-oriented design. However, the Internet allows publishers to incorporate other video, audio, and animated graphics into its stories (Berry, 2001). Pirolli and Card (1999) use the analogy of a visitor exploring a web page as a comparison to an animal foraging for food. Murphy, Hofacker and Mizerski (2006) summarized this analogy by Pirolli and Card (1999) by saying that "the calories spent foraging for food must be less than the calories that the food provides" (p. 53). This drives home the point that no matter the navigational elements used within a website, their functionality should seek to provide users with easily retrievable information.

While layout is critical, Berry (1998) argued that perhaps the strongest contributor to message recall is a participant's interest in the subject matter. Berry (2001) also observed that other factors that influence a user's ability to recall news content include educational level (Findahl & Höijer, 1985), gender (Findahl & Höijer, 1985; Gunter, Furnham, & Gietson, 1984), and even the time of day that the news is consumed (Gunter, Jarrett, & Furnham, 1983).

Though no research has been conducted on clickable and scrollable listicle format types, there exists some literature on the navigation of news websites and its effect on recall. Pipps et al., (2009) found that online news was best recalled when content was presented in text-only or text and static image format. Of the four versions tested by Pipps et al., (2009), recall was lowest among the version featuring captions and an accompanying video, and closely behind was a version that used animated graphics to present information.

Berry (2001) however, found that while some studies have pointed to video and animation additions to text as negatively impacting recall, her study found that there was little difference between the two. Berry (2001) suggests that though these additional elements did not

detract from overall recall, the presence of these additional pieces did not significantly enhance recall. These results suggest that smaller organizations with more limited budgets can still produce effective and memorable content without having to include these additional elements (Berry, 2001).

Hoffman and Novak (1996) observed, just over two decades ago, that the flow of content should align with the skills and competency of the user. The CME model created by Hoffman and Novak (1996) puts forth variables that relate to flow experience, anxiety level, and a user's decision to exit any form of content early. Many of the current findings on content format and navigation and its impact on recall will likely continue to evolve as users become more digitally savvy and as user preferences adapt over time. Gershon (2013) said, "In time, tastes, consumer preference and technology change. Routine and past success can sometimes make an industry slow to change" (p. 53).

Listicles and Eye-Tracking

Eye-tracking has been used across a variety of disciplines for over thirty years (Chu, Paul, & Ruel, 2009). Eye-tracking is often referred to as scan path analysis, because it records the movements of the human eye across the screen (John, 2009). There are several types of eye movements that can be tracked using this methodology including pursuit, vergence, vestibular, nystagmus, drifts, microsaccades, saccades, and fixations (Rayner, 1998). For purposes of this research, we will focus on audience fixations (John, 2009). Fixations are defined as points where the subject's eye stops to process a certain piece of information (Goldberg & Kotval, 1999; Jacob & Karn, 2003; Just & Carpenter, 1976; Rayner, 1988). This research will aim to understand whether the average length of eye fixation is higher among clickable or scrollable listicle format.

The complexities introduced by using eye-tracking methodology bring about several limitations (Leckner, 2012). Leckner (2012) observed that “eye-tracking studies are performed under artificial conditions; the subjects may be affected and behave differently than they normally do, even if they say they do not” (p. 165).

Suppes (1994) observed that one of the main things missing from eye-tracking research is an understanding of the visual processing that takes place prior to information being stored in long-term memory. Additional measures should often be included in an eye-tracking research to augment its findings in visual attention and scan path patterns. Because this research attempts to understand differences in two listicle format types, a posttest survey will be necessary to test for memorability of content in order to augment the eye-tracking findings.

Cognitive Load

In the current communication and technology era, there is more information available than is possible to process. In the last century, information has gone from a scarcity to an overabundant resource (Roda, 2011). The scarce resource now is human attention. With the amount of information available in the information age, the ability to consume is the biggest factor (Roda, 2011). New platforms and services attempt to reduce the amount of effort needed to consume information by providing organized and synthesized information.

Knowing that barriers to consuming information exist from a variety of sources, it is becoming critical that information be shared in an optimal way to create recall efficiency. Cognitive load theory (Sweller, 1988) is based on the idea that humans have a limited working memory capacity and thus, "Cognitive load theory has been designed to provide guidelines intended to assist in the presentation of information in a manner that encourages learner activities that optimize intellectual performance" (Sweller; Van Merriënboer, & Paas, 1998). This theory

and its application to teaching and online presentation of information will become increasingly valuable as the supply of available information increases.

Little (2010) described one of the key roles of cognitive load theory. “Cognitive load theory seeks to reduce or manage the working memory load, or cognitive load, in order to assist learners in developing meaningful learning experiences” (p. 53). Knowing that the load is greater than the available cognitive resources that process information, Roda (2011) argued that digital systems should be designed in a way that allows for fast access to information that supports human attentional processes in order to reduce cognitive load.

Chu and colleagues (2009) used eye-tracking to examine online news navigation effectiveness for various formats including slide-shows, breaking news formats, as well as design options for links to other pages. Similarly, this research aims to evaluate listicle presentation strategies used for sharing online news and information. Coleman, Mendelson, Kurpieus, and Lieber (2004) observed that user navigation testing on websites is regularly performed on commercial websites that sell products to consumers, but that they were unable to find any literature relating to news website navigation and performance. Because of the lack in literature in regards to news website navigation, research is needed to understand whether certain types of navigation increase or decrease cognitive load as these are important indicators of recall.

One study by Chang-Hoan (2003) showed that users are more likely to have lower recall levels of a story when clicking occurs because it draws attention from consuming content and impacts the limited processing ability of the user. However, as online users of all ages become more familiar with various features and functions of online news websites, it can be argued that the cognitive effort needed to complete particular navigational tasks is reducing and these functions are becoming second nature (Sundar & Constantin, 2004). However, self-report data

shows that news segments using multiple devices were perceived as lacking in structure, producing lower levels of perceived coherence and increased levels of perceived confusion (Sundar & Constantine, 2004).

Understanding how listicles serve in relieving or adding to cognitive load is critical in understanding its efficiency as a vehicle. The purpose of this research is to understand which listicle format serves as the best vehicle for delivering information that aids in recall, ultimately by reducing cognitive load. Identifying strategies for delivering information with the fewest barriers will become increasingly important in building an understanding of cognitive load theory applications in the digital age.

Signal Detection Theory

Signal detection theory and methods have been used to examine memory judgments in a variety of audio and visual memory research (Fox, 2004). One of the strengths is that it allows users to rank their memory strength and recall, making it a valuable method for comparing two or more conditions (Fox, 2004). Memory studies typically have two phases—a study and a test phase (Shapiro, 1994). In the study portion, a subject is exposed to visual, aural, or written information (Shapiro, 1994). In the test phase, a subject is exposed to target items, which are pulled from the information presented in the study phase, as well as new items, that were not presented as part of the original subject matter (Shapiro, 1994). New items are referred to as foils, distractors, or lures (Shapiro, 1994). Correct recognitions of a target item are referred to as hits, and incorrect recognitions of foil item are called false alarms (Macmillan & Creelman 1991; Shapiro 1994). Memory sensitivity, denoted by d′, is measured by "subtracting the proportion of false alarms, converted to a standard score, from the proportion of hits, also converted to a standard score" (Fox, 2004, p. 533).

Those that are able to detect the old versus the new information are seen as being more effective at discriminating between noise and signals (Macmillan & Creelman, 1991; Fox, 2004). This methodology works with any number of old or new items because even though some scales may include a variety of items, signal detection theory relies on the probability of distributions along a continuum, and those change to scale regardless of the number of items (Fox, 2004).

Based on a review of the literature, it is clear that there is a gap in research surrounding listicles, particularly in the way in which their navigational differences impact recall. Though some research has been conducted regarding online presentation of information using a variety of navigational elements to examine recall (Berry, 2001; Sundar & Constantin 2004; Chu et al., 2009) this type of research has yet to be extended to listicles. Because nobody has researched listicles in terms of navigational differences, or even made the observation that two types of listicles exist (clickable and scrollable), the following research questions are necessary to establish a lens through which listicles can be studied:

Research Questions

RQ 1: Will overall recall be higher for scrollable or clickable listicle format?

RQ 2: Will memory sensitivity be higher for scrollable or clickable listicle format?

RQ 3: Will total eye fixation duration will be higher for the scrollable or clickable listicle format?

H 1: Those that found the content interesting will have significantly higher levels of memory sensitivity.

CHAPTER 3

METHOD

Stimulus

This study used eye-tracking software and signal detection methodology in order to compare two types of listicle format. Signal detection theory has been used in a variety of audio and visual research in psychology and communications. Though Signal Detection Theory is regularly used in communications research to measure the memorability of audio and video stimuli, a few studies have used text-based stimuli to measure participant's memory of content.

As the stimuli for this study, two listicles were designed, one with a clickable interface and the other with a scrollable interface. The text and images in each of the listicles were identical so that memory comparisons between the two formats could be properly assessed. The subject title of the listicle was "10 Ways to Find Shed Antlers" and dealt with a lesser known activity referred to as shed hunting. As observed by Findahl & Höijer, (1985), prior knowledge of subject matter plays a role in news retention, thus this study aims to limit this additional factor by providing information that is likely new to participants. Shed hunting is an activity that many hunters and hikers pursue during the springtime and involves finding the antlers that deer, elk and moose shed each year. This is an ideal topic because the nature of the information is new to most people, so one participant does not have an advantage over another based on prior subject knowledge.

Though most listicles follow a similar pattern in structure and design, this research wanted to delineate between two distinct types of listicles which we define as scrollable and clickable types. Scrollable types of listicles are viewed within a single webpage, they simply

require scrolling up and down in order to engage with the content. Clickable listicles on the other hand require the user to click an arrow or navigational feature to skip to the next page. In other words, a listicle that contains 10 separate bulleted pieces of information would require 10 clicks. The stimuli for this study was created using an online website service called Wix (see Appendix A and Appendix B), which made it possible to create content that mirrors other online formatted listicles. The images and text used are original content created by the researcher and were not sourced from elsewhere.

Testing Instrument

The testing instrument contained 10 target items of factual information that were present in both versions of the listicle. There were also 10 foil items, or information that related to the subject of the content but that were not presented in the listicles. All of the target information was presented in text, but was also supported by still photographs, used to illustrate and support the written text. For a comprehensive list of the target and foil items used in this memory test, see Table 1.

Pretest

To determine whether the instrument was valid, a pretest was used to ensure that no values of zero were found for either correct or false recognition rates (Fox, 2004). None of the pretest participants in this study correctly recognized all 10 target items that were present in the shed hunting listicles. The average correct recognition rate was 6.3, while the average false recognition rate was 4.1.

Table 1.

Target and Foil Items From Memory Recognition Test Instrument

Target Items	Foil Items
Chasing or pursuing elk, deer, and moose on foot during the winter months is unethical.	Search for antlers on north facing mountain slopes, these are feeding grounds for elk and deer.
Search for antlers under trees and brush where elk, deer, and moose rest and sleep.	Australian sheperds make the best shed dogs.
Once you have found one antler, it is likely that its match is within 100 yards.	Summer is the best time for shed hunting, because there is less snow to hike through.
Written permission from a landowner is needed to shed hunt on private property.	Google maps has features that show private and public land.
Dogs can use their nose to sniff out and find antlers.	Minox makes binoculars and scopes that a large percentage of shed hunters use.
Antlers that recently dropped will have a brown and gold color.	Dogs are great shed hunters because they have excellent endurance.
Moose lose their antlers as early as November and December.	Look near fences where antlers get caught in the barbed wire and fall off.
Bedding areas are typically near a water source.	You can find shed antlers on many popular hiking trails.
Deer can lose up to 20 percent their body weight during the winter months.	Deer antlers can be sold for $13-14 per pound.
Elk can grow as much as one inch of antler a day during the late spring and early summer	onXmaps shows you where other shed antlers have been found in the past.

Participants

92.7% white, 3.6% Hispanic, Latino, or Spanish origin, 3.6% Native Hawaiian or Pacific Islander.

This study consisted of 55 participants between the ages of 18-35 with 24% male and 76% female representation. Because the sample for this study was pulled from undergraduate courses that skewed more female, the sample also reflected this difference. Participants were selected from undergraduate students at Brigham Young University and were informed of this study in a classroom announcement. Those participating in the study provided their email address so that they could be contacted and schedule a time that best met their schedule. When

students arrived for participation in this study, they were directed to the eye-tracking lab where they received an explanation of their rights as subjects and a brief explanation of what was required of them as subjects. Students were given extra credit in their respective communications classes for participation in this study.

Eye-Tracking Equipment

Data was collected using an Applied Science Laboratories (ASL) D6HS high-speed eye-tracker running at 120Hz (Applied Science Laboratories, 2011). This device utilizes a bright pupil tracking method, relying on an infrared light and camera to discern each participant's pupillary reflection in relation to his or her corneal reflection—and these reflections were correlated to a 9-point grid displayed on a computer screen to determine gaze location. The ASL D6HS also utilizes proprietary algorithms to account for participant head movement, which enhances the quality of the gaze data.

During calibration, each participant was instructed to look at each of the nine points on the grid one at a time, while the researcher captured the reflection data at each point. Once calibration was complete, the researcher asked each participant to look at all nine points again to verify an accurate calibration. In cases of inaccurate calibrations, the calibration procedure was performed again, occasionally with adjustments being made to subject seating position in between attempts, as needed. Once subjects were successfully calibrated, seating position was not adjusted.

Normal seating position for subjects was within a range of 22 to 24 inches from the ASL D6HS, which sat on a desktop under a 24-inch Dell UltraSharp monitor configured to a resolution of 1920x1200. All stimuli displayed on the screen were positioned so as to not interact

with the outer 200 pixels on either side of the x axis, to avoid potential aberrations at the edge of the trackable range.

Stimuli were presented using the iMotions 6.1 biometrics software suite, which integrates eye-tracking with facial recognition, galvanic skin response (GSR), and electroencephalography (EEG) capabilities. The iMotions platform is an all-in-one package that facilitates stimuli presentation, data collection, and data analysis. All participant data fixation data was processed through iMotions, and stored on an encrypted and secured computer in the eye-tracking lab.

Procedure

Each student was randomly served one type of listicle (clickable or scrollable). We ensured that participants' exposure to the stimuli was randomized. Randomizing the order in which participants received the stimuli accounted for any biases in the way ordering effects the outcomes of the recall. Students were told to spend as much time with the article as they normally would in a home browsing environment. This was done to ensure that there was ample processing time for each of the subjects to view the content in a way that fit their personal preferences.

Following the tracking of participants' eye movements, subjects were led to an adjoining room where they were administered a survey to test for content recall. The survey was taken in the same room and on the same computer on which the articles and listicles were viewed to ensure that no mediating factors disrupted recall. The survey was 11 questions in length and took the subjects about five minutes to complete.

Measures

Fixation duration can be measured as the total time a subject spent on either a single fixation, or the aggregate fixation duration across all fixations (John, 2015). For purposes of this research, overall fixation duration was gathered for each subject. Research indicates that while lengthier fixation times can be indicative of a high interest in the content, it can also be a sign that a subject had difficulty interpreting or deciphering a stimulus (Hooge & Erkelens, 1996; Just & Carpenter, 1976). Interpreting whether lengthier fixations are indicative of more thorough processing will be indicated when coupling this measure with survey performance.

Signal Detection Theory

To determine recall measures, the overall hit rate, or the correct recognition of target items, was compared between the conditions. Memory sensitivity is calculated by converting false alarms and hits to a standard z-score and then calculating the proportion between those two numbers (Macmillan & Creelman, 1991; Shapiro, 1994; Shapiro & Fox, 2002). Sensitivity, denoted by d′, is calculated by subtracting the proportion of false alarms, converted to a standard score, from the proportion of hits, also converted to a standard score (Macmillan & Creelman, 1991; Shapiro, 1994; Shapiro & Fox, 2002). A larger d′ value is indicative of a more sensitive judgement in discriminating between old information and new information (Macmillan & Creelman, 1991; Shapiro, 1994; Fox, 2004). If the hit rate is the same as the false alarm rate, d′ equals zero, and the performance could be due to chance which indicates that the participant was unable to discriminate between items that were and were not present (Macmillan & Creelman, 1991; Fox, 2004).

Sensitivity as a measure is potentially infinite because it has no maximum performance level. Because of this, those that perform the test with perfect accuracy likely perform at that

level due to a statistical sampling error. In these instances of perfect performance, a conversion of a 0 should be made to 1/(2n) and from 1 to 1–1(2n) (Macmillan & Creelman, 1991; Shapiro, 1994; Shapiro & Fox, 2002). If, for whatever reason, there is a considerable number of participants that perform perfectly on the test, it could be indicative of an issue with the experimental design and it may need a full redesign in order to avoid any ceiling or floor effects (Macmillan & Creelman, 1991; Shapiro, 1994).

Interest

The construct for interest used for this study was based on a construct by Smith, Chen and Yang (2008). Participants were asked to rate the level with which they agreed with the following using a 1–5 Likert scale ranging from strongly disagree to strongly agree: "This article made me curious about shed hunting" and "I would like more information about shed hunting." Chronbach's alpha for the interest subscale was ($\alpha = .81$).

Analysis

Statistical analyses were done using IBM SPSS v24 predictive analytics software. Statistical power calculations were executed using G*Power 3.1.5 (Faul, Erdfelder, Buchner, & Lang, 2009; Faul, Erdfelder, Lang, & Buchner, 2007). For t-tests, effect size standards are small ($d = .20$), medium ($d = .50$), and large ($d = .80$). Achieved power for the independent sample t-tests was good for the detection of large effects (.83), adequate for the detection of medium effects (.44), and poor for the detection of small effects (.11).

Whenever small sample size is a concern, so is type 2 error and the chance that there is insufficient power to detect significant effects. According to John (2015), "Capturing eye-tracking data is a laborious process, and, as such, sample sizes in eye-tracking literature tend to be smaller than those of comparable non-eye-tracking studies" (52-53). This study utilized an

adequate sample by eye-tracking standards and used the significance threshold of $p < .05$ for analysis.

CHAPTER 4

RESULTS

The main objective of this study was to determine whether scrollable or clickable listicle types perform better in terms of recall and eye-tracking fixation duration. Signal detection theory was used in conjunction with eye-tracking to measure the overall effectiveness of each format. The average time spent with the listicle in condition one was 3 minutes and 12 seconds, while the average length spent with condition two was 3 minutes and 48 seconds. The eye-tracking analysis revealed that condition one achieved 84% accuracy of eye-tracking data and that condition two achieved 87% accuracy.

Bivariate Correlation Matrix: Eye-Tracking Measures

A bivariate correlation matrix was created to examine relationships between eye-tracking, memory sensitivity, and other demographic variables. As shown in Tables 2A and 2B, there were several strong correlations among the variables of interest. While many of the relationships between variables are to be expected, there are also several relationships that help to elucidate the findings.

Desire to try shed hunting was, expectedly, strongly correlated with the interest construct (r = .83); those who reported higher levels of interest also showed increased desire to try searching for shed antlers, and vice versa. In addition, total number of fixations correlated positively with individuals who reported higher levels of curiosity about the content (r = .36), desire for information (r = .37), and accurate recall of content (r = .42). Similar results manifested for total fixation duration (r = .37 for curiosity, r = .30 desire, and r = .39 for recall, respectively).

RQ 1. The first research question predicted that recall or "hit rate" would be higher for the scrollable listicle format. To test this question, an independent sample t-test was run with a presentation format as the independent variable (scrollable = 1, clickable = 2) and hit rate as the outcome variable. Results indicated that scrollable (M = 6.44, SD = 1.61) and clickable presentation formats (M = 6.50, SD = 1.68), t (53) = -.14, p = .89) yielded no significant differences in participant hit rate.

RQ 2. The second research question predicted that the scrollable content would produce higher memory sensitivity than the clickable format type. To test this question, an independent sample t-test was run with presentation format as the independent variable (scrollable = 1, clickable = 2) and memory sensitivity as the outcome variable. Results indicated that scrollable (M = -.22, SD = 1.52) and clickable presentation formats (M = .18, SD = 1.28), t (53) = -1.06, p = .29) yielded no significant differences in participant memory sensitivity.

RQ 3. Eye-tracking software typically reports fixation duration in milliseconds. In this study, values in milliseconds were converted to seconds to make comparison more general for readers less familiar with eye-tracking research. Research question 3 predicted that the total fixation duration would be highest for the scrollable format. To test this question, an independent sample t-test was run with presentation format as the independent variable (scrollable = 1, clickable = 2) and fixation duration as the outcome variable. Results indicated that scrollable (M = 133.66, SD = 69.77) and clickable presentation formats (M = 156.62, SD = 46.07), t (53) = -1.409, p = .17) yielded no significant differences in fixation duration.

H 1. The first hypothesis predicted positive relationships between interest and the outcome variable of memory sensitivity. To test each of these hypotheses, Pearson correlation coefficients were generated. Hypothesis 1 predicted that those who found the content interesting

would show significantly higher levels of memory sensitivity; a correlation manifested a significant positive relationship between these two variables ($r = .30$, $n = 55$, $p = .026$). Overall, results indicate that there was a significant difference between the presentation format of a listicle and performance, as evidenced by memory and recall.

Table 2A

Bivariate Correlation Matrix

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
1.		.03	.06	.28*	-.06	-.04	-.04	-.22	.35*	-.06	.07	.01	-.03	-.01	-.01	-.04	.28*	-.13
2.			.01	-.05	.23	.20	.10	-.18	.03	.09	-.19	.09	.14	.01	.09	-.33*	-.17	.14
3.				.41*	.12	.11	-.02	-.14	-.08	-.11	.21	-.30*	-.10	-.17	-.22	.05	-.03	.03
4.					-.17	-.13	-.06	.08	.64*	.06	-.16	.14	-.02	.01	.04	.06	.27	-.33*
5.						.97*	.41*	.08	-.11	.07	-.11	.36*	.37*	-.03	.25	-.20	-.01	.42*
6.							.60*	.09	-.07	.06	-.06	.37*	.30*	-.52	-.22	-.16	.03	.39*
7.								-.07	-.02	.03	.17	.26	.00	-.06	.06	.09	.08	.20
8.									-.09	.1	-.15	-.10	.05	.08	.09	-.16	.16	.03
9.										-.13	-.05	-.13	-.23	-.14	-.20	.07	.15	-.24
10.											-.09	.34*	.14	.12	.23	-.02	.26	.10
11.												-.14	-.13	.10	-.05	.36*	.09	.02
12.													.68*	.53*	.85*	-.13	.10	.28*
13.														.48*	.92*	-.18	-.03	.27*
14.															.55*	-.03	.01	-.03
15.																-.17	.04	.30*
16.																	.14	-.21
17.																		-.07
18.																		

Table 2B

Variable Key for Table 2a

1. Subject
2. Condition
3. Gender
4. Age
5. Total Number of Fixations
6. Total Fixation Duration (seconds)
7. Contextual Seconds
8. Ethnicity
9. Education Level
10. Social Media Usage (in terms of hours per week)
11. Familiarity with content
12. Curiosity about content
13. Desire for more information
14. Desire to try shed hunting
15. Interest Construct
16. Pictures
17. Number Breaks
18. Recall

Note. $N = 55$.

CHAPTER 5

DISCUSSION

The first research question that this study sought to answer is whether the scrollable or clickable listicle format produces greater levels of recall. The results indicated that there was no difference between the scrollable and listicle types in terms of recall. This supports findings by Sundar and Constantin (2004), who suggest that as the online community, and in particular digital natives (those who grew up with the internet), have become so accustomed to a variety of interfaces, that online navigational features do not detract from performance in terms of recall. As users continue to become more used to a variety of online interfaces, the ability of users to perform well within a variety of interfaces will continue to increase.

These findings should be further tested to compare a wider range of navigational differences between layouts in news and information presentation strategies online, to understand if certain navigational features help or hinder recall performance. Chu and colleagues (2009), observed that even small differences in navigation can have an impact on the user experience within a website. For example, a slide show can use an arrow or a next button to prompt the user to the next slide and these small choices can impact the amount of time a user spends viewing each slide (Chu et al., 2009). While these initial findings do not indicate that differences in listicle navigation produce significant deviations in recall performance, research that looks at identical content carrying a wider range of navigational differences has the potential to produce different outcomes.

It should be noted that the sample used in this study is comprised college-aged pre-communication majors who are often regarded and referred to as digital natives. Knowing that

these students are more likely to be tech-savvy individuals who have learned to navigate a variety of online interfaces, these findings aren't generalizable. It is critical that similar research is conducted using a more varied sample in order to understand whether differences exist between digital natives and other groups of individuals. Older demographics may still prefer to read news and information in a layout that more closely mirrors a more traditional print layout. Understanding how recall is impacted by familiarity and preference of news layout will help inform news outlets on best practices based on their target audiences.

Similar to the first research question, the second research question sought to answer whether the scrollable or clickable listicle format produced greater levels of memory sensitivity. Memory sensitivity is a measure used in signal detection theory to indicate how well a participant was able to detect the old versus the new information following exposure to the stimulus (Macmillan & Creelman, 1991; Fox, 2004). The findings indicate that participants were not significantly better at detecting old versus new information in one format versus another. These results further support the recall findings in research question 1. While participants that were exposed to the clickable listicle performed slightly better on memory sensitivity, the difference was not significant and is likely due to the fact that they spent, on average, 36 more seconds with the content. Though this research did not point to any significant difference between memory sensitivity and format, the difference in average time spent with each version is notable. These differences could be due to the lab setting, in which participants may feel the need to devote more attention to the stimulus than they would in a home browsing situation.

The average time spent with each of the conditions was likely due to the decision-making process of the reader that the navigational elements invoked. The scrollable format may make the reader feel as if they can move through the information while maintaining the option to easily

revisit a prior paragraph. Thus, those that view the scrollable format move through the content at a much quicker rate than those who view the same content in the clickable form. Even though the clickable format also allows users to hit the back arrow and return to the previous slide, the decision to move forward with the clickable content seemed to be a more definitive decision, as very few participants returned to prior slides.

The third research question asked whether a significant difference existed between clickable and scrollable formats in terms of eye fixation duration. Eye-tracking research has shown that increased fixation duration may be indicative of higher levels of interest in the content (Hooge & Erkelens, 1996; Just & Carpenter, 1976). While navigational differences exist between the two formats used in this study, the text and images seem to be more important in determining whether fixations will occur than the actual navigational difference. Because the content was identical in terms of the text and images, the differences in fixation duration were not significant. However, those that were interested in the content spent significantly more time fixating on the content, which led to greater recall. Navigation did not play a significant role in increasing or decreasing the level at which individuals fixated on the content.

Perhaps the most important finding of this study is that it may not matter whether a news organization or online content producer uses one type of listicle over another. While this research did not explicitly ask participants whether they prefer clickable or scrollable interfaces, these findings do show that the memorability of the content is unaffected based on the two types of navigation examined. Thus, practitioners should ensure that content is king and that it is relevant to their readership. In terms of producing memorable content, it does not appear that one format is stronger than the other.

The first and only hypothesis assumed that those who found the content in the listicles to be interesting would perform better in terms of memory sensitivity. As expected, there was a significant relationship between interest and memory sensitivity. These findings support the findings by Berry (1988), suggesting that information is better recalled when an individual holds a manifest interest in the content. These findings show that news outlets and content producers should seek to provide interesting and relevant content to their readership, and further builds on the argument that content plays a more significant role than navigation. These findings are supported by Chu and colleagues (2009), who observed that "if there is no personal interest, even the best design may be unable to impact the reader's attention and recall of information" (p. 41).

Because listicles have not been researched broadly in the academic community, this foundational research creates an argument for the relevancy of the topic in today's digital age, but also the need for further research in this area. The current study helps to answer the gap described by Chu and colleagues (2009), who noticed that while much has been done to compare the visual design presentation of stories, navigational differences among identical content need further exploration. Though listicles have become a commonly used format for delivering editorial content as well as native advertising messages, no research has been conducted to compare listicle formats in terms of recall. These findings provide a framework for looking at navigational differences in listicles and also other forms of online content.

Memory Sensitivity as a Measure

While signal detection theory is widely used in other disciplines as a means for measuring differences in memory performance, this method is also valuable in visual communications research. Signal detection theory is particularly effective in comparing two or more formats in terms of memorability (Macmillan & Creelman 1991; Shapiro 1994; Fox, 2004)

a frequently used measure in communication research. While this method has been used mainly for comparing memory between audio and visual messages, it certainly has application for comparing text based content as well.

Research Application to Industry

Clickable and scrollable type listicles are used widely by a host of content creators. Understanding the strengths and weaknesses of each layout presentation in terms or content recall and user preference is valuable. Though no significant differences were shown between navigation and recall, it is important to note that relevant content produces higher rates of fixations. Interest is a key variable in terms of determining how well content will be recalled (Berry, 1988). This study reinforces this finding by adding to it that the total number of fixations will be higher when an individual finds the content interesting.

News outlets and content producers must not sacrifice quality of content for monetary gain. Native advertising is playing a significant role in content production practices as news organizations must find new ways to monetize their businesses with advertising revenue. Because liticles are easily produced and shared online through social media and other online platforms, this content type becomes a natural fit for creating journalistic advertorial content. However, it is worrisome that findings by Wojdynski and Evans (2016), suggest that less than 8% of participants in their study recognized native advertising content as advertising. If listicles are to be seen as effective and reliable sources of information, content producers must treat them as such. Content needs to create value for the readers, if financial gain is the main goal, the content is likely to suffer. Partnerships with brands should be done only when it is in line with the goals and mission of the publisher.

Industry practitioners should be wary of putting out content for the sake of putting out content. Some argue that listicles are just another form of clickbait (Dodson, 2016), and while this is true in some instances, many reputable sources are using listicles to provide structure and format to their stories and information in very impactful ways. To Leonhardt's (2015) point, as easy as it may be to downplay the value of the listicle, "they're really no different from traditional articles, quotations, photographs, charts or statistics. They're an extremely useful tool of expression that can be used well or used poorly" (para. 7). While clicks remain an important metric, outrageous headlines that direct users to content in a variety of formats including listicles will have a deleterious impact on reputation overtime if the content itself is absent of substance. Research needs to be conducted to examine the reputational impacts on news outlets that frequently rely clickbait and sensational headlines to drive impressions. Though this would is a challenge to study in a lab setting, researchers should find longitudinal methods to study the perceptions of news outlets over time based on their content production practices.

Limitations and Future Research

Because eye-tracking studies are performed under artificial conditions, the behavior of subjects may be less consistent than in a home environment (Leckner, 2012). One of the primary limitations of this study is that it strictly provides insights into navigational differences between two types of listicles. Future research should include versions of content that present similar information using a variety of formats and layouts. Looking forward, it would be of great value to compare a variety of listicle formats that share distinguishing differences but communicate the same material. For example, a listicle in video format versus a more traditional print and online formats.

In addition to eye-tracking and recall tests, other methodologies should be used to examine listicles. Survey method research in conjunction with qualitative approaches may be a better initial approach to gathering information on why various content choices and navigational elements are preferred by users. These surveys should be extended across age groups to discover whether age plays a critical role in the preference of certain navigational elements. These sorts of findings would be of great value to news organizations that cater to a specific demographic.

As with most experimental design, research factors, including educational level and in particular reading level, can have a great impact on performance in terms of recall (Findahl & Höijer, 1985). Because this study relied on a sampling of college aged students with similar backgrounds, it is impossible to generalize these findings. Future research should aim to find a more balanced sample of subjects with a more diverse range of backgrounds.

Future research could also examine the impact of the use of listicles on news source credibility over time. This could also extend to research regarding native listicles and whether native content in the form of listicles is more easily recognized than more traditional online formats (Wojdynski & Evans, 2016). These types of findings will assist news outlets as they seek to generate advertising revenue while also striving to maintain readership and also provide insight to the legality and ethicality of certain types of disclosure.

Though listicle are typically created and published in text and image based formats, video-form listicles have started being produced by popular content creators including Buzzfeed. in the last few years and are worth researching in terms of content recall (Hughes 2016). While this research suggests no significant differences between clickable and scrollable listicles, cross-comparing video and text based listicles may yield more significant differences.

Conclusion

The primary goal of this research was to understand differences between clickable and scrollable listicle formats in terms of memory sensitivity and fixation duration. This type of research will become increasingly valuable as scholars and media practitioners seek to find innovative ways to organize and present information in a crowded online space. The listicle is a useful format for synthesizing anything from news about the Kardashians to neuroscience. Understanding how various navigational elements impact overall user experience and information recall is critical.

Though no significant differences were found in terms of memory sensitivity between the scrollable and clickable listicle versions, these findings are not in vain. This research shows that the message is more critical to the performance of a listicle than its clickable or scrollable navigational elements. Listicles are one of many available structures that online content creators can use to share messages. Others include infographics, short videos, gifs, interactive maps, and other formats that aid in presenting information in a way that reduces cognitive load and allows for better recall of information. Comparing these modes of communication and researching which ones are most effective in-terms of producing greater recall of alike content will prove to be valuable as practitioners seek to adopt best practices for their respective organizations.

References

Berry, C. (1988). Memory studies and broadcast messages. In M. M. Gruneberg, P. E. Morris, & R. N. Sykes (Eds.), *Practical Aspects of Memory: Current Research and Issues*. (Vol. 1, pp. 434-439). New York: John Wiley and Sons.

Berry, L. (2001). Comprehension and recall of Internet news: A quantitative study of web page design. *Journal of Magazine and New Media Research,* 3. Retrieved from http://aejmcmagazine.arizona.edu/Journal/Fall2000/Berry.pdf

Beyer, S., & Gorris, L. (2009, November 11). We like lists because we don't want to die. *Spiegel Online*. Retrieved from http://www.spiegel.de/international/zeitgeist/spiegel-interview-with-umberto-eco-we-like-lists-because-we-don-t-want-to-die-a-659577.html

Bojko, A. (2006). Using eye tracking to compare web page designs: A case study. Journal of Usability Studies, 3(1), 112–120.

Brown, C. H. (1952). *News editing and display*. New York: Harper.

Canvavilhas, J., & Satuf, I. (2015). Who brings the news? Exploring the aggregators apps for mobile devices. In Miguel, A., Juan (Ed.), *Emerging Perspectives on the Mobile Content Evolution*. (pp. 220-237). Hershey, PA: IGI Global.

Carlson, M. (2015). When news sites go native: Redefining the advertising–editorial divide in response to native advertising. *Journalism*, *16*(7), 849–865.

Chang-Hoan, C. (2003). The effectiveness of banner advertisements: Involvement and click-through. *Journalism & Mass Communication Quarterly*, *80*(3), 623–645.

Chang-Hoan, C., & Hongsik C. J. (2004). Why do people Avoid advertising on the Internet? *Journal of Advertising*, *33*(4), 89–97.

Chu, S., Paul, N., & Ruel, L. (2009). Using eye tracking technology to examine the effectiveness of design elements on news websites. *Information Design Journal (IDJ)*, *17*(1), 31–43.

Coleman, R., Mendelson, A., Kurpius, D., & Lieber, P. (2004). Public life and the Internet: If you build a better website, will they become engaged? *Conference Papers -- International Communication Association*, 1.

Cordell, R. (2015). Viral textuality in nineteenth-century US newspaper exchanges. In V. Alfano & A. Stauffer (Eds.), *Virtual Victorians* (pp. 29–56). New York: Palgrave Macmillan.

Dodson, S. (2016, October 24). Four reasons why listicles and clickbait are killing real journalism. *The Conversation.* Retrieved May 24, 2017, from http://theconversation.com/four-reasons-why-listicles-and-clickbait-are-killing-real-journalism-67406

DoubleClick (2003, January). DoubleClick 2002 full-year ad serving trends. Retrieved, from http://www.doubleclick.com/us/knowledge/documents/trend_reports/dc_2002adservingtrends_0212.pdf

Drèze, X., & Hussherr, F. X. (2003). Internet advertising: Is anybody watching? *Journal of Interactive Marketing (John Wiley & Sons)*, *17*(4), 8–23.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. Behavior Research Methods, 41, 1149-1160.

Faul, F., Erdfelder, E., Lang, A.G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior Research Methods, 39, 175-191.

Feasley, F. G., & Stuart, E. W. (1987). Magazine Advertising Layout and Design: 1932-1982. Retrieved from https://search.lib.byu.edu/byu/record/edsbyu.buh.4670982?holding=8ad9f5iirob1qd5h

Findahl, O., & Höijer, B. (1985). Some characteristics of news memory and comprehension. *Journal of Broadcasting and Electronic Media*, 29, 379-396.

Fox, J. R. (2004). A signal detection analysis of audio/video redundancy effects in television news video. *Communication Research*, *31*(5), 524–536.

Freeman, J. (2016). The use of listicles in early 20th century women's magazines. Paper presented at the 35th annual conference of the Global Awareness Society International, Budapest, Hungary, May 26-29, 2016.

Garber, M. (2015, October 15). The Tao of the listicle. Retrieved April 20, 2017, from https://www.theatlantic.com/entertainment/archive/2015/10/the-glory-of-the-listicle/410740/

Gershon, R. A. (2013). Digital media innovation and the Apple Ipad: Three perspectives on the future of computer tablets and news delivery. *Journal of Media Business Studies (Journal of Media Business Studies)*, *10*(1), 41–61.

Goldberg, J. H., & Kotval, X. P. (1999). Computer interface evaluation using eye movements: Methods and constructs. *International Journal of Industrial Ergonomics*, *24,* 631-645.

Gottfried, R. A. (2014). Six ways this article is most definitely not an ad: Deceptive marketing and the need for clearly-defined disclosure rules in online native advertisement. *Loyola Consumer Law Review*, *27*, 399.

Gunter, B., Furnham, A., & Gietson, G. (1984). Memory for the news as a function of the channel of communication. *Human Learning Journal of Practical Research and Applications*, 3, 265-271.

Gunter, B., Jarrett, J., & Furnham, A. (1983). Time of day effects on immediate memory for television news. *Human Learning Journal of Practical Research and Applications*, 2, 261-267.

Hoffman, D. L., & Novak, T. P. (1996). Marketing in hypermedia computer-mediated environments: Conceptual foundations. *Journal of Marketing*, *60*(3), 50–68. https://doi.org/10.2307/1251841

Hughes, S. (2016, April 7). A list of reasons to add video to your listicle articles. *Wibbitz* Retrieved from http://blog.wibbitz.com/a-list-of-reasons-to-try-our-new-listicle-format

Jacob, R. J. K., & Karn, K. S. (2003). Eye tracking in human-computer interaction and usability research: Ready to deliver the promises. In J. Hyönä, R. Radach, & H. Deubel (Eds.), *The mind's eye: Cognitive and applied aspects of eye movement research* (pp. 573-605). Radarweg, Amsterdam: Elsevier.

Jansen, F. (2014). How bulleted lists and enumerations in formatted paragraphs affect recall and evaluation of functional text. *Information Design Journal (IDJ)*, *21*(2), 146–162.

John, K. K. (2015). Using eye-tracking to optimize skin self-examination training. (Unpublished doctoral dissertation). University of Utah, Salt Lake City, UT.

John, K. K. (2009). Adolescent interest in alcohol responsibility messages (Master's Thesis). Retrieved from https://search.lib.byu.edu/byu/record/lee.4344835?holding=d5jy73hrjmn48rbv

Just, M. A., & Carpenter, P. A. (1976). Eye fixations and cognitive processes. *Cognitive Psychology, 8,* 441-480.

Kaiser, U., & Kongsted, H. C. (2012). Magazine "Companion Websites" and the Demand for Newsstand Sales and Subscriptions. Retrieved from https://search.lib.byu.edu/byu/record/edsbyu.buh.84379759?holding=lfsjywg4v1fj4phe

Konnikova, M. (2013, December 2). A list of reasons why our brains love lists. *The New Yorker*. Retrieved from http://www.newyorker.com/tech/elements/a-list-of-reasons-why-our-brains-love-lists

Leckner, S. (2012). Presentation factors affecting reading behaviour in readers of newspaper media: an eye-tracking perspective. *Visual Communication*, *11*(2), 163–184.

Leonhardt, D. (2015, April 24). In defense of the listicle. *New York Times.* Retrieved from http://www.nytimes.com/2015/04/25/upshot/in-defense-of-the-listicle.html?_r=0http://www.nytimes.com/2015/04/25/upshot/in-defense-of-the-listicle.html?_r

Lieb, T. (2015) *Editing for the digital age*. Retrieved from https://us.sagepub.com/en-us/nam/editing-for-the-digital-age/book241528

Little, J. J. (2010). Cognitive load theory and library research guides. *Internet Reference Services Quarterly, 15(1), 53-63*. Retrieved from http://digitalcommons.brockport.edu/drakepubs/9

MacMillan, N., & Creelman, C. (1991). *Detection theory: A user's guide*. Cambridge, UK: Cambridge University Press.

Mersey, R. D., Malthouse, E. C., & Calder, B. J. (2010). Engagement with online media. *Journal of Media Business Studies (Journal of Media Business Studies)*, *7*(2), 39–56.

Murphy, J., Hofacker, C., & Mizerski, R. (2006). Primacy and Recency Effects on Clicking Behavior. *Journal of Computer-Mediated Communication*, *11*(2), 522–535

Peterson, B. (2015). There were listicles that went viral long before there was an internet. *Smithsonian Magazine*. Retrieved, from http://www.smithsonianmag.com/innovation/listicles-went-viral-long-before-internet-180955742/

Pipps, V., Walter, H., Endres, K., & Tabatcher, P. (2009). Information recall of Internet news: Does design make a difference? A pilot study. *Journal of Magazine & New Media Research*, *11*(1), 1–20.

Pirolli, P., & Card, S. (1999). Information foraging. *Psychological Review*, *106*(4), 643–675.

Radder, N. J., & Stempel, J. E. (1942). *Newspaper editing, make-up and headlines*. New York: McGraw Hill.

Rayner, K. (1998). Eye movements in reading and information processing: 20 years of research. *Psychological Bulletin*, 124(3), 372-422.

Razzouk, N., & Seitz, V. A. (2002). Banner advertising and consumer recall: An empirical study. *Journal of Promotion Management*, *9*(1/2), 71.

Richman, D., & James, R. (2009, March 16). Seattle P-I to publish last edition Tuesday. Retrieved from http://www.seattlepi.com/business/article/Seattle-P-I-to-publish-last-edition-Tuesday-1302597.php

Roda, C. (2011). *Human attention in digital environments* [E-book version]. Retrieved from *https://search.lib.byu.edu/byu/record/lee.5210011?holding=zh6ppsm0wqckzynx*

Chu, S., Paul, N., & Ruel, L. (2009). Using eye tracking technology to examine the effectiveness of design elements on news websites. *Information Design Journal (IDJ)*, *17*(1), 31–43. https://doi.org/10.1075/idj.17.1.04chu

Sang Yeal Lee, & Yong-Suk Cho. (2010). Do web users care about banner ads anymore? The effects of frequency and clutter in web advertising. *Journal of Promotion Management*, *16*(3), 288–302.

Schaudt, S., & Carpenter, S. (2009). The news that's fit to click: An analysis of online news values and preferences present in the most-viewed stories on azcentral.com. *Southwestern Mass Communication Journal*, *24*(2), 17–26.

Shapiro, M., & Fox, J. (2002). The role of typical and atypical events in story memory. *Human Communication Research*, *28*(1), 109-135.

Shapiro, M. (1994). Signal detection measures of recognition memory. In A. Lang (Ed.), Measuring psychological responses to media messages (pp. 133-148). Hillsdale, NJ: Lawrence Erlbaum.

Sheehan, B. (2016, Feb 3). More effective native advertising is a solution to ad blockers. *Advertising Age*. Retrieved from http://adage.com/article/digitalnext/effective-native-ads-a-solution-ad-blockers/302476/

Smith, Robert E., Jiemiao Chen, and Xiaojing Yang (2008). The impact of advertising creativity on the hierarchy of effects. *Journal of Advertising*, 37 (4), 47-61.

Sternadori, M. (2013). History of early American magazines repeating itself. *Journal of Magazine & New Media Research*, *14*(1), 1–2.

Step, C. S. (1999). Then and now. *American Journalism Review*, *21*(7), 60.

Sundar, S. S., & Constantin, C. (2004). Does interacting with media enhance news memory? Automatic vs. controlled processing of interactive news features. *Conference Papers -- International Communication Association*, 1.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, *12*(2), 257–285.

Sweller, Van Merriënboer, J. & Paas, F. (1998). Cognitive architecture and instructional design. *Educational Psychology Review. 10(3): 251–296.*

Turcotte, J., York, C., Irving, J., Scholl, R. M., & Pingree, R. J. (2015). News recommendations from social media opinion leaders: Effects on media trust and information seeking. *Journal of Computer-Mediated Communication*, *20*(5), 520–535.

Utt, S. H., & Pasternack, S. (1993). Infographics today: Using qualitative devices to display quantitative information. *Newspaper Research Journal*, *14*(3/4), 146–157.

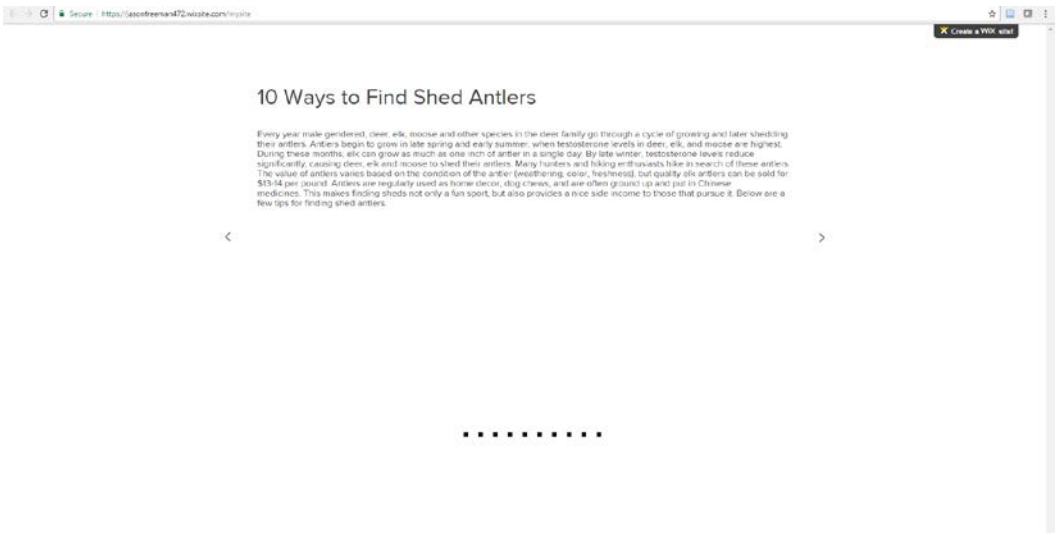
Vijgen, B. (2014). The listicle: An exploring research on an interesting shareable new media phenomenon. *Studia Universitatis Babes-Bolyai - Ephemerides*, (1), 103–122.

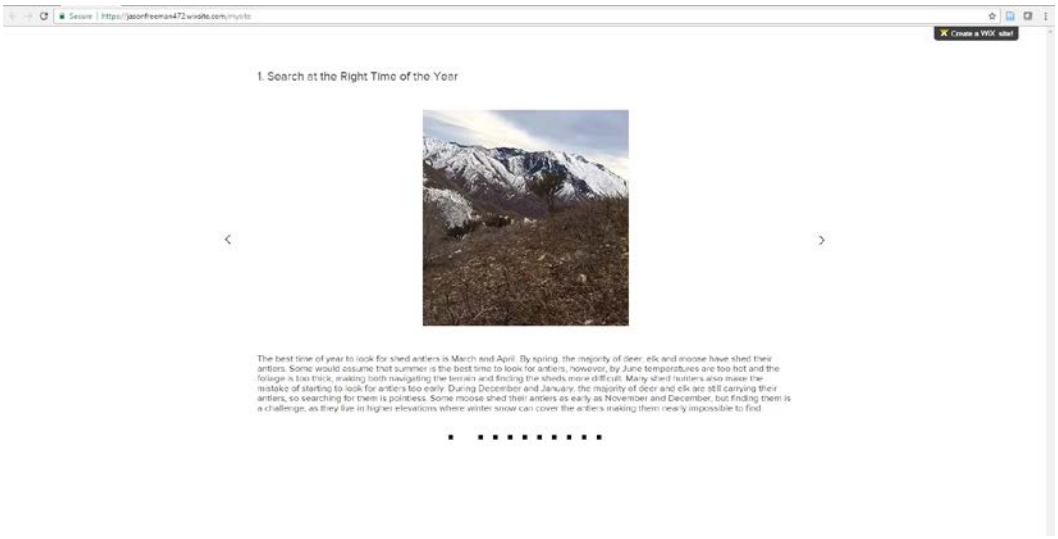
Why listicles are here to stay. (2013). Retrieved March 9, 2016, from http://www.adweek.com/fishbowlny/why-listicles-are-here-to-stay/264154

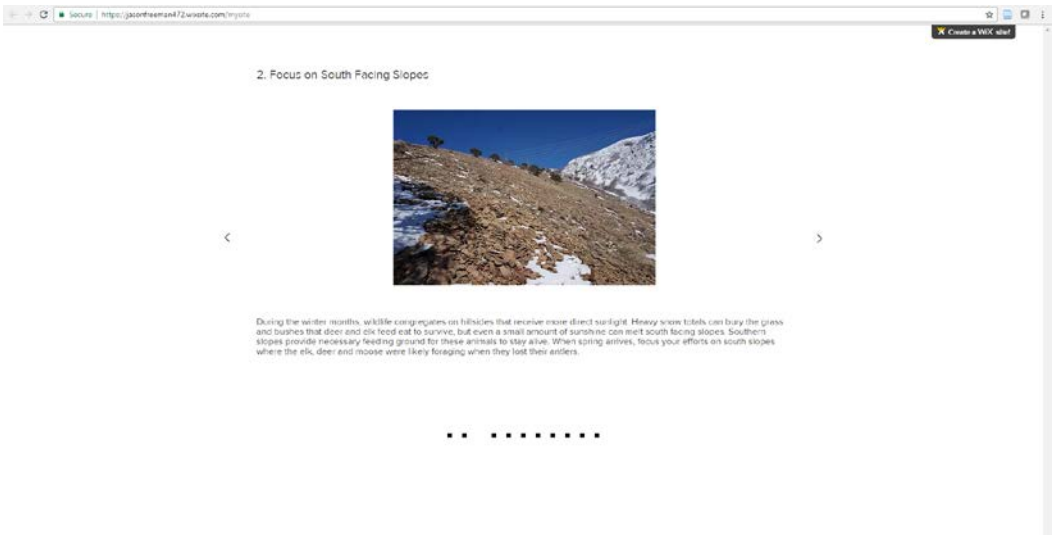
Wojdynski, B., & Evans, N (2016). Going native: Effects of disclosure position and language on the recognition and evaluation of online native advertising. *Journal of Advertising*, *45*:2, 157-168.

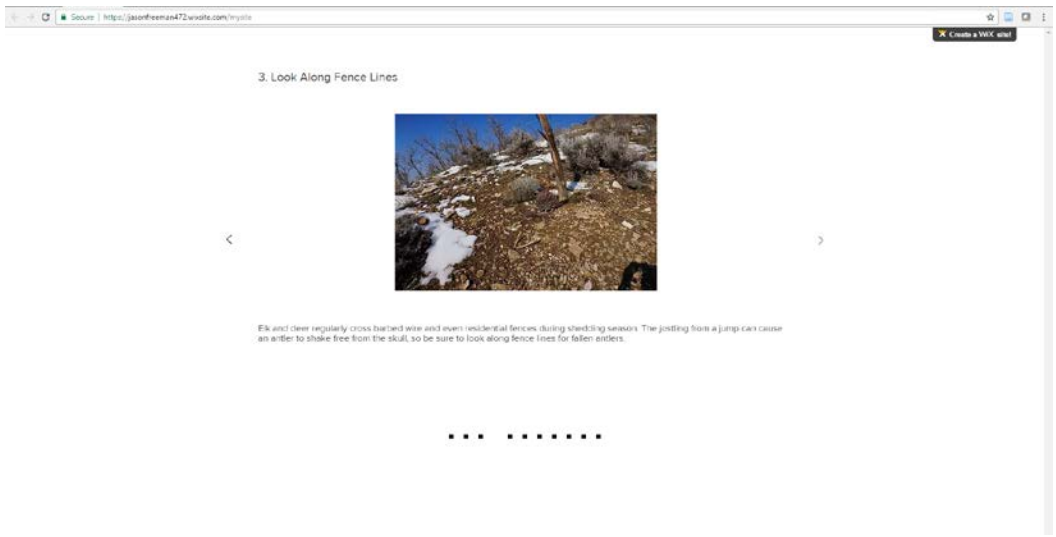
Zappavigna, M. (2015). Searchable talk: the linguistic functions of hashtags. *Social Semiotics*, *25*(3), 274–291.

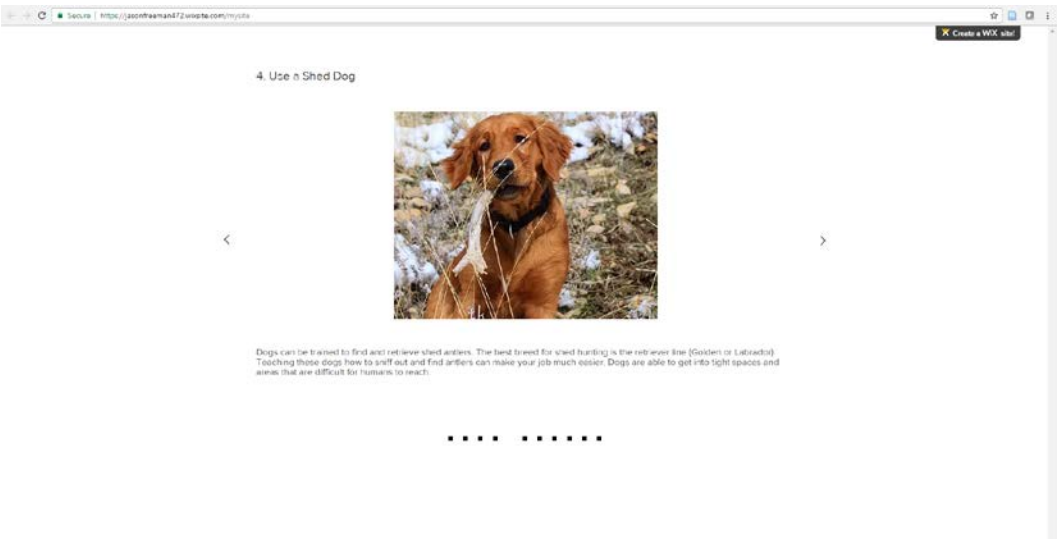
Appendix A – Clickable Format (Not to scale)

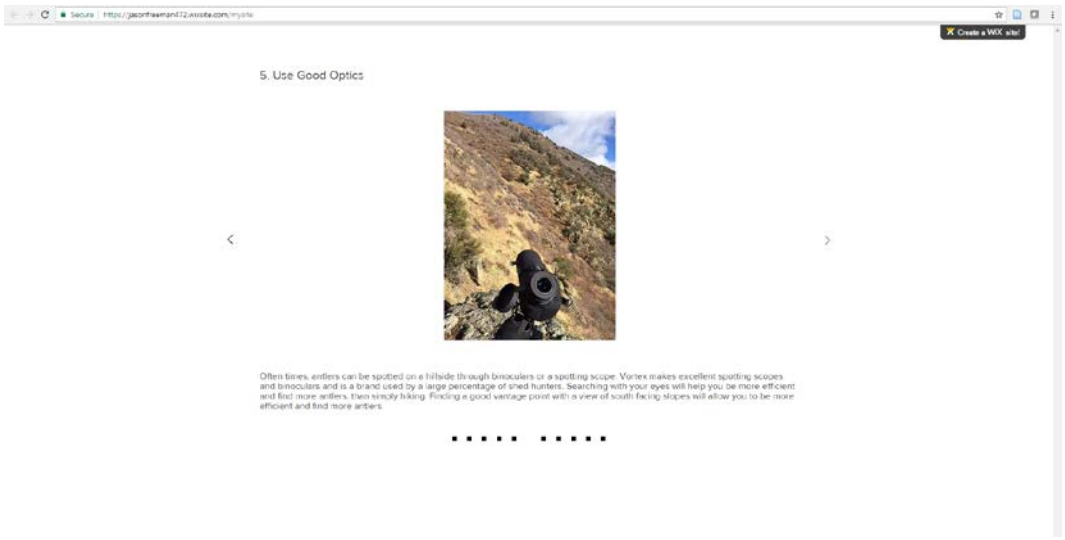





2. Focus on South Facing Slopes
During the winter months, wildlife congregates on hillsides that receive more direct sunlight. Heavy snow totals can bury the grass and bushes that deer and elk feed eat to survive, but even a small amount of sunshine can melt south facing slopes. Southern slopes provide necessary feeding ground for these animals to stay alive. When spring arrives, focus your efforts on south slopes where the elk, deer and moose were likely foraging when they lost their antlers.

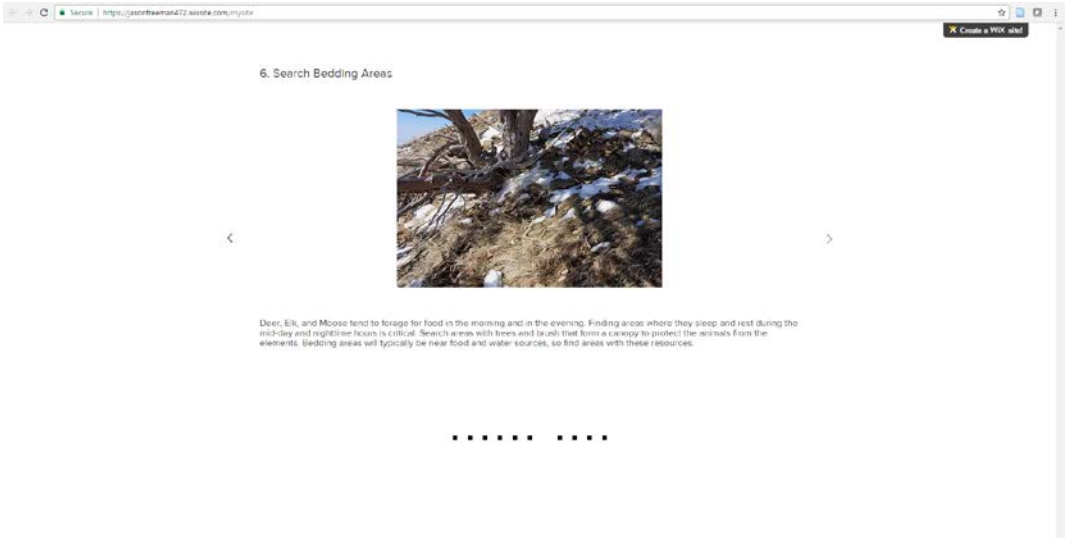

3. Look Along Fence Lines
Elk and deer regularly cross barbed wire and even residential fences during shedding season. The jostling from a jump can cause an antler to shake free from the skull, so be sure to look along fence lines for fallen antlers.


4. Use a Shed Dog
Dogs can be trained to find and retrieve shed antlers. The best breed for shed hunting is the retriever line (Golden or Labrador). Teaching these dogs how to sniff out and find antlers can make your job much easier. Dogs are able to get into tight spaces and areas that are difficult for humans to reach.



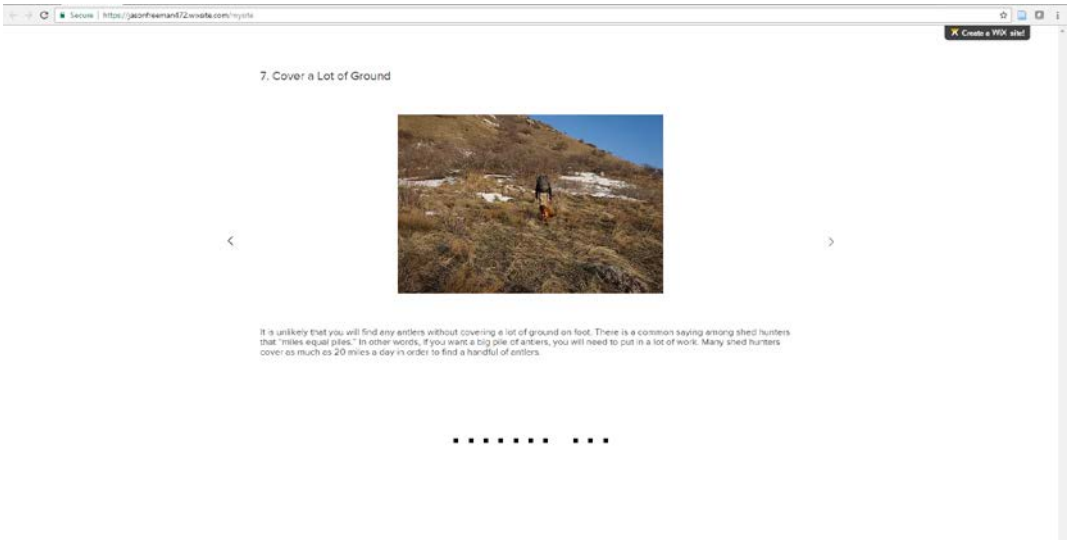
5. Use Good Optics

Often times, antlers can be spotted on a hillside through binoculars or a spotting scope. Vortex makes excellent spotting scopes and binoculars and is a brand used by a large percentage of shed hunters. Searching with your eyes will help you be more efficient and find more antlers, than simply hiking. Finding a good vantage point with a view of south facing slopes will allow you to be more efficient and find more antlers.



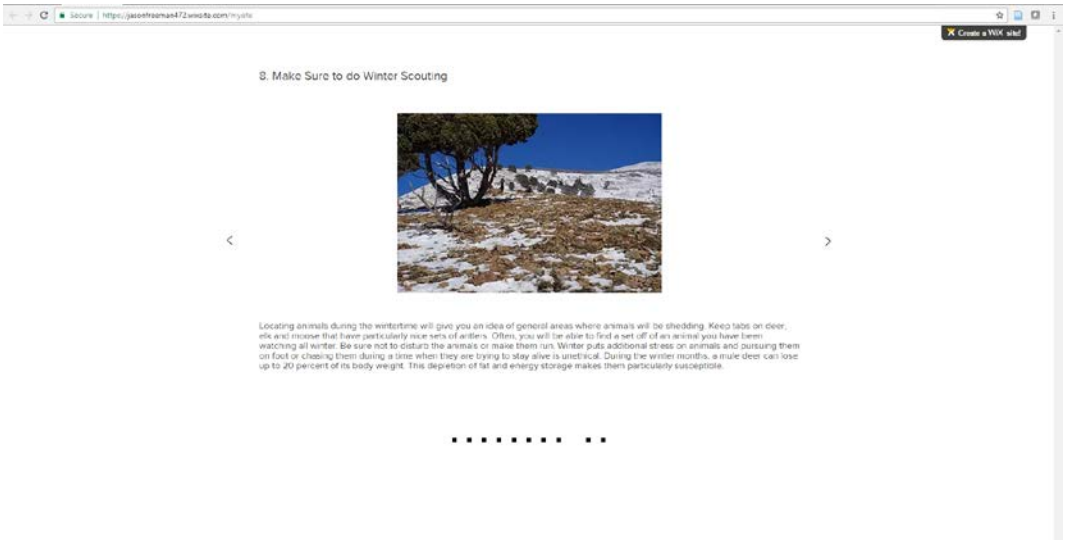
6. Search Bedding Areas

Deer, Elk, and Moose tend to forage for food in the morning and in the evening. Finding areas where they sleep and rest during the mid-day and nighttime hours is critical. Search areas with trees and brush that form a canopy to protect the animals from the elements. Bedding areas will typically be near food and water sources, so find areas with these resources.



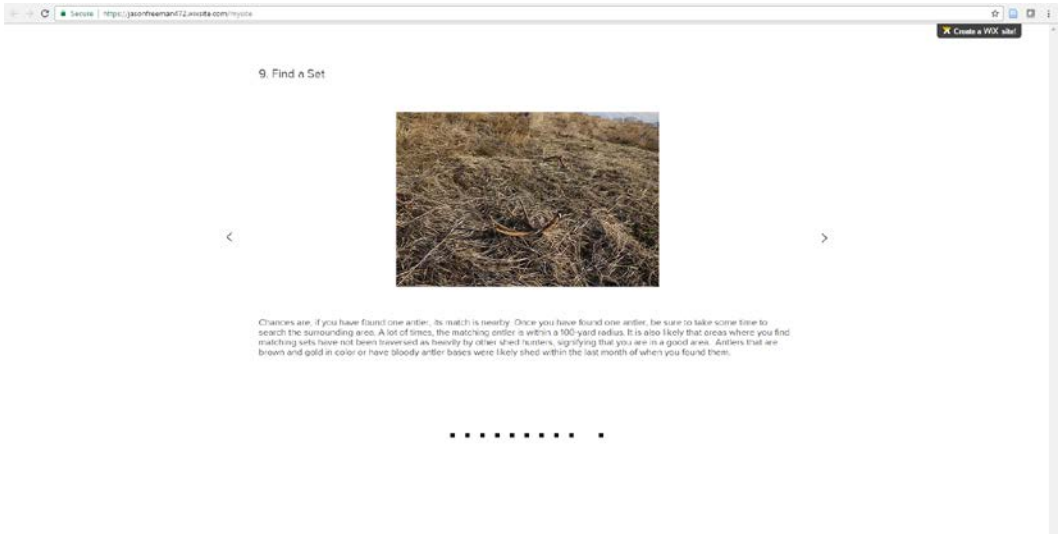
7. Cover a Lot of Ground

It is unlikely that you will find any antlers without covering a lot of ground on foot. There is a common saying among shed hunters that "miles equal piles." In other words, if you want a big pile of antlers, you will need to put in a lot of work. Many shed hunters cover as much as 20 miles a day in order to find a handful of antlers.



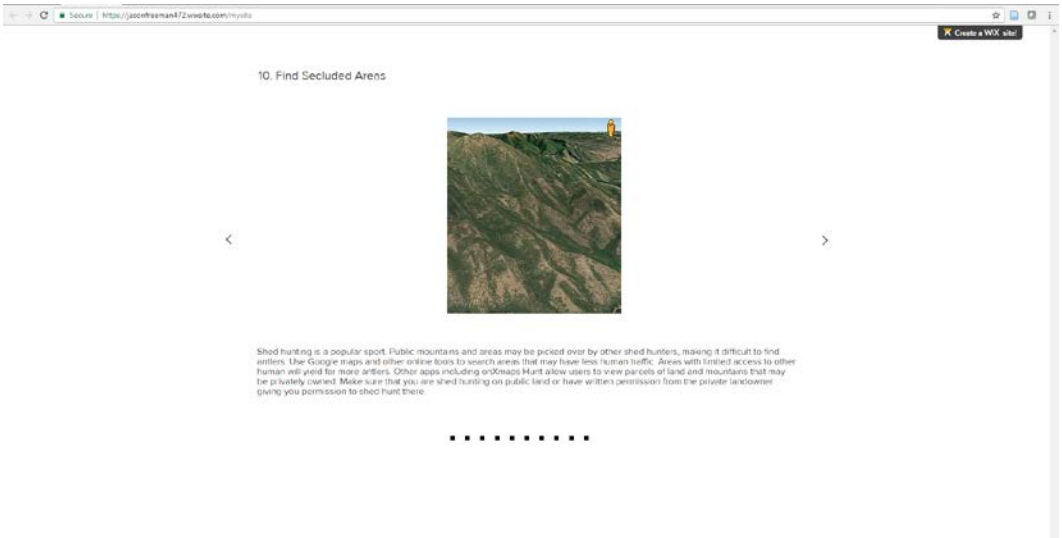
8. Make Sure to do Winter Scouting

Locating animals during the wintertime will give you an idea of general areas where animals will be shedding. Keep tabs on deer, elk and moose that have particularly nice sets of antlers. Often, you will be able to find a set off of an animal you have been watching all winter. Be sure not to disturb the animals or make them run. Winter puts additional stress on animals and pursuing them on foot or chasing them during a time when they are trying to stay alive is unethical. During the winter months, a mule deer can lose up to 20 percent of its body weight. This depletion of fat and energy storage makes them particularly susceptible.



9. Find a Set

Chances are, if you have found one antler, its match is nearby. Once you have found one antler, be sure to take some time to search the surrounding area. A lot of times, the matching antler is within a 100-yard radius. It is also likely that areas where you find matching sets have not been traversed as heavily by other shed hunters, signifying that you are in a good area. Antlers that are brown and gold in color or have bloody antler bases were likely shed within the last month of when you found them.



10. Find Secluded Arens

Shed hunting is a popular sport. Public mountains and areas may be picked over by other shed hunters, making it difficult to find antlers. Use Google maps and other online tools to search areas that may have less human traffic. Areas with limited access to other human will yield for more antlers. Other apps including onXmaps Hunt allow users to view parcels of land and mountains that may be privately owned. Make sure that you are shed hunting on public land or have written permission from the private landowner giving you permission to shed hunt there.

Appendix B – Scrollable Format (Not to scale)

10 Ways to Find Shed Antlers

Every year male gamekeed, deer, elk, moose and other species in the deer family go through a cycle of growing and later shedding their antlers. Antlers begin to grow in late spring and early summer, when testosterone levels in deer, elk, and moose are highest. During these months, elk can grow as much as one inch of antler in a single day. By late winter, testosterone levels reduce significantly, causing deer, elk, and moose to shed their antlers. Many hunters and hiking enthusiasts hike in search of these antlers. The value of antlers varies based on the condition of the antler (weathering, color, freshness), but quality elk antlers can be sold for $10+/lb per pound, antlers are regularly used as home decor, dog chews, and are often ground up and put in birthday medicines. This makes finding shed's not only a fun quest, but also provides a nice side income to those that pursue it. Below are a few tips for finding shed antlers.

1. Search at the Right Time of the Year

The best time of year to look for shed antlers is March and April. By spring, the majority of deer, elk, and moose have shed their antlers. Some could assume that summer is the best time to look for antlers, however, by June temperatures are too hot and the foliage is too thick to effectively search for antlers. Late winter is the best time to look for antlers. Not only is it the end of the shedding season, but animals are beginning to congregate on hillsides that receive more direct sunlight. Heavy snow tends can bury the grass and bushes that deer and elk feed on to survive, but even a small amount of sunshine can melt south facing slopes. Southern slopes provide necessary feeding ground for these animals to stay alive. When spring arrives, focus your efforts on south slopes where the elk, deer and moose were likely foraging when they lost their antlers.

2. Focus on South Facing Slopes

3. Look Along Fence Lines

Elk and deer regularly cross barbed wire and even residential fences during shedding season. The jostling from a jump can cause an antler to shake free from the pouch, so be sure to look along fence lines for fallen antlers.

4. Use a Shed Dog

Dogs can be trained to find and retrieve shed antlers. The best breed for shed hunting is the retriever line (Golden or Labrador). Teaching these dogs how to sniff out and find antlers can make your job much easier. Dogs are able to get into tight spaces and areas that are difficult for humans to reach.

5. Use Good Optics

6. Search Bedding Areas

Deer, Elk, and Moose tend to forage for food in the morning and in the evening. Finding areas where they sleep and rest during the midday, and nighttime hours is critical. Search areas with trees and brush that form a canopy, to protect the animals from the elements. Bedding areas will typically be near food and water sources, so find areas with these resources.

7. Cover a Lot of Ground

It is unlikely that you will find any antlers without covering a lot of ground on foot. There is a common saying among shed hunters that "miles equal piles." In other words, if you want a big pile of antlers, you will need to put in a lot of work. Many shed hunters cover as much as 20 miles a day in order to find a handful of antlers.

8. Make Sure to do Winter Scouting

Locating animals during the wintertime will give you an idea of general areas where animals will be shedding. Keep tabs on deer, elk and moose that have particularly nice sets of antlers. Often, you will be able to find a set off of an animal you have been watching all winter. Be sure not to disturb the animals or make them run. Winter puts additional stress on animals and pursuing them on foot or chasing them during a time when they are trying to stay alive is unethical. During the winter months, a mule deer can lose up to 20 percent of its body weight. This depletion of fat and energy storage makes them particularly susceptible.

9. Find a Set

Chances are, if you have found one antler, its match is nearby. Once you have found one antler, be sure to take some time to search the surrounding area. A lot of times, the matching antler is within a 100-yard radius. It is also likely that areas where you find matching sets have not been ravaged as heavily by other shed hunters, signifying that you are in a good area. Antlers that are brown and gold in color or have bloody antler bases were likely shed within the last month of when you found them.

10. Find Secluded Areas

Shed hunting is a popular sport. Public mountains and areas may be picked over by other shed hunters, making it difficult to find antlers. Use Google maps and other online tools to search areas that may have less human traffic. Areas with limited access to other humans will yield far more antlers. Other apps including onXhaqu Hunt allow users to view parcels of land and mountains that may be privately owned. Make sure that you are shed hunting on public land or have written permission from the private landowner giving you permission to shed hunt there.

Appendix C – Survey

Research Subject #_____ Article Condition_____

Directions: This survey is meant to help the researchers determine your perceptions and recall of article content and advertising content within an article. Please answer all questions truthfully. Your identity will not be recorded. Thank you.

1. What is your gender?

a) Male
b) Female

2. What is your age? _____

3. Which category describes you?

- White
- Hispanic, Latino, or Spanish origin
- Black or African American
- Asian
- American Indian or Alaska Native
- Middle Eastern or North African
- Native Hawaiian or Other Pacific Islander
- Some other race, ethnicity, or origin

4. How many years of higher education (college) have you completed?

a) One year
b) Two years
c) Three years
d) Four years
e) More than four years

5. Approximately how many hours a week do you spend on social media?

a) I don't use social media
b) Less than 1 hour a week
c) About 1 hour a week
d) About 2 hours a week
e) About 3 hours a week
f) About 4 hours a week
g) About 5 hours a week
h) More than 5 hours a week

6. How familiar were you with the content in the article that you read?

1----------2----------3----------4----------5

Not at all Familiar Moderately familiar Extremely Familiar

7. The article made me curious about shed hunting?

1----------2----------3----------4----------5

Not Curious Moderately Curious Very Curious

8. I would like more information about shed hunting.

1----------2----------3----------4----------5

Strongly Disagree Undecided Strongly Agree

9. I would like to try shed hunting sometime.

1----------2----------3----------4----------5

Strongly Disagree Undecided Strongly Agree

10. Please rate the importance of each of the following elements based on the article you read.

Pictures

1----------2----------3----------4----------5

Not Important Moderately Important Very Important

Number Breaks

1----------2----------3----------4----------5

Not Important Moderately Important Very Important

11. Please check whether each of the items were presented in the article that you read about shed hunting. For each item you check Yes/No please indicate how confident you are that the item **was** or **was not** present in the article.

	Was the item presented in the article? Yes	No	How Confident are You?
Search for antlers on north facing mountain slopes, these are feeding grounds for elk and deer.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Australian shepherds make the best shed dogs.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Summer is the best time for shed hunting, because there is less snow to hike through.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Chasing or pursuing elk, deer, and moose on foot during the winter months is unethical.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Google Maps has features that show private and public land.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident

Search for antlers under trees and brush where elk, deer, and moose rest and sleep.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Once you have found one antler, it is likely that its match is within 100 yards.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Minox makes binoculars and scopes that a large percentage of shed hunter's use.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Dogs are great shed hunters because they have excellent endurance.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Look near fences where antlers get caught in the barbed wire and fall off.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Written permission from a landowner is needed to shed hunt on private property.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
You can find shed antlers on many popular hiking trails.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Dogs can use their nose to sniff out and find antlers.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident

Antlers that recently dropped will have a brown and gold color.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Moose lose their antlers as early as November and December.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Bedding areas are typically near a water source.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Deer antlers can be sold for $13-14 per pound.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
onXmaps shows you where other shed antlers have been found in the past.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Deer can loose up to 20 percent their body weight during the winter months.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident
Elk can grow as much as one inch of antler a day during the late spring and early summer.			1----------2----------3----------4----------5 Not Confident | Somewhat Confident | Neutral | Confident | Very Confident