ADVERTISEMENT BLINDNESS IN SOCIAL MEDIA APPS

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ABSTRACT

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Advertisement blindness (ad blindness) is a general term that refers to people's tendency to automatically and unconsciously ignore advertisements. The phenomenon was originally identified in banner ads, then later in text and native ads on websites. Today, social media is an effective tool for advertisers, yet research investigating users' interaction habits with social media ads in mobile applications (apps) is unexplored. This study expands the ad blindness concept to mobile social media apps, examining its presence and whether target position has an influence. Further, it investigates the relationship between social media use and ad blindness. Employing a novel approach, the study uses a dynamic mock news feed to measure ad blindness in social media posts. 65 young adults performed semantic searches within a stream of ad and content posts, with varied target positions on their phones. Target location accuracy was the major dependent variable, and participants had higher accuracy in content posts than in ad posts, providing evidence for ad blindness. Ad avoidance was especially prevalent in the last third of the news feed. We also explored the relationship between ad blindness and social media use, however, there was no significant correlation between the two. Overall, these results revealed the first evidence of ad blindness on social media mobile applications. Also, the findings suggest that ads are more effective at the beginning of the feed, which has real-world applications for parties of interest.

Keywords: advertisement blindness, ad blindness, social media apps, habituation

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When people use their computers to browse a website, they tend to ignore large, graphical advertisements, a phenomenon known as "banner blindness" (Benway, 1998). Further research using desktop computer stimuli has established that participants also ignore text advertisements on webpages (Owens et al., 2011, 2014), advertisements and native ads on social media websites (Barreto, 2013; Bode et al., 2017). Collectively, this phenomenon is known as "advertisement blindness" (ad blindness) and refers to users' tendency to avoid attending to any type of advertisement seen on websites. Speck and Elliott (1997) defined ad avoidance as, "all actions by media users that differentially reduce their exposure to ad content" (p. 61). Prior research has focused on banner blindness solely on desktop computers and websites, however, social media mobile applications are a major gateway to ad exposure.

Today, more people than ever make connections and access information through smartphones instead of desktop computers (Enge, 2021). News media and businesses can reach people through their smartphones anywhere because they are always within reach. On average, users spend two hours per day browsing social media (Statista, 2022), and during that time they are exposed to many sponsored ads. Social media has become one of the key communication tools for advertisers and the number of ads displayed on social media are constantly increasing (Maslowska et al., 2021). Galán et al. (2019) conducted a large-scale analysis and found that Facebook displays about 70 ads per week to their users, representing between 10% and 15% of the content in the users' news feeds (i.e., news feed is where personal posts and ads are displayed on Facebook). However, to our knowledge, ad blindness

has not been studied in social media apps viewed on smartphone devices. Smaller screens, habituation, and ad display format may all contribute to users ignoring advertisements on social media apps (Maslowska et al., 2021; Portnoy, 2012). We investigate whether these factors play a role in users' visual attention to ads on a smartphone and therefore might drive ad dismissal (Ohme et al., 2021). In the next section, we will review research on banner blindness and then discuss how it evolved into the more general concept of ad blindness.

Advertisements on Websites

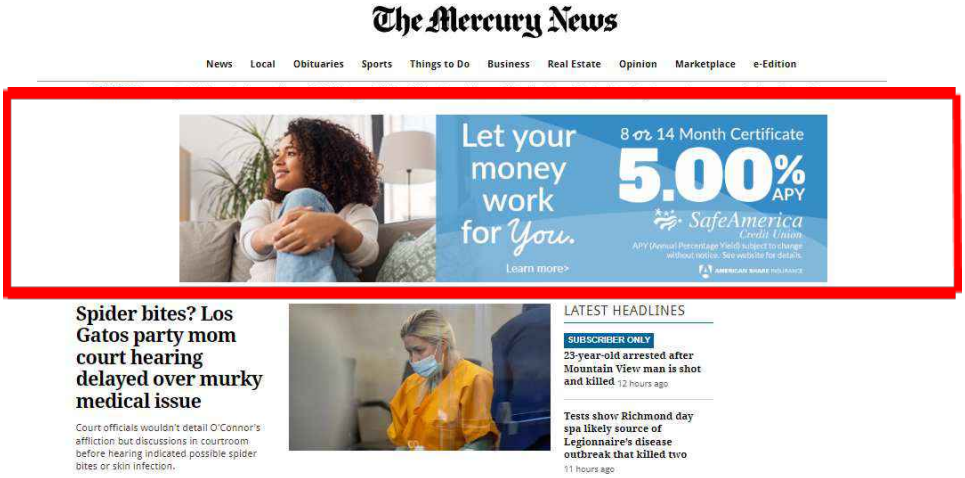
Banner Advertisements

In 1994 a new marketing tool, a banner ad for AT&T was introduced in an online magazine called HotWired and changed the advertising business into what we know today (D'Angelo, 2009). Banner ads are graphical displays of advertisements on a website and are most often placed at the top of the webpage (Figure 1). When a user clicks on these banner ads, it redirects them to a website with information about the product or service the advertisement was promoting. In 2019, the Interactive Advertising Bureau (IAB) reported that banner ads generated $38.1 billion in the US, 31% of all online advertising revenue (PwC, 2020).

To measure banner ad effectiveness, advertisers use a metric called click-through rate (CTR), which is the percentage of time people clicked on an ad and were then directed to a page linked to the advertisement. CTR is a way to quantify ad performance and its capabilities to drive traffic (Facebook, 2022). While the first banner ad CTR published in 1994 was 44% (McCambley, 2013), the average in 2018 was only 0.05% (display ad CTR) (Chaffey, 2022). Ads in Facebook's news feed have a CTR of 1.11% (device not specified),

Figure 1

Example of a Banner Advertising in an Online News Site



Note. The first image shows an example of a graphic banner ad (marked with a red rectangle) on The Mercury News homepage on August 8. Source: mercurynews.com.

however, the right side ad placement (banner ad) CTR is only 0.16% (Chaffey, 2022). The highest reported CTR for Facebook was 1.61% (Kandey, 2021). Since 1994, the display ad CTR rate has dropped from 44% to 0.05%, evidence that users typically avoid clicking on ads. Moreover, some people use ad blocking software to completely remove them from view. A study conducted by the Internet Advertising Bureau in the United Kingdom (IAB UK, 2020) on ad blocking found that 23.7% of British adults use ad-blocking software, 21% use it on a laptop or a desktop, and 10% on a smartphone. While the internet was young and banner ads were new, people liked to experiment by clicking on them, but now users have learned to turn a blind eye to such ads, a phenomenon called *banner blindness*.

Banner Blindness

Banner blindness was first identified in 1998 by Benway when she found that users ignored banner advertisements when performing a search task on websites in usability

studies. The researcher tasked six participants to do 26 searches and find information (e.g., the email address for a hotel) in a mock website (Figure 2).

Figure 2
Example of a Banner Ad from a Study

Note. The image shows an example of the website from Benway's (1998) study. The red rectangle is a banner ad.

Participants performed two types of search tasks. In one, the target information was located in hypertext links, and in the other, the participants needed to click on the banner ads. After finishing the task, participants filled out a survey about whether they found the task's target and used a five-point scale to rate the level of difficulty involved in finding the target. Participants were more successful finding targets in hypertext links (94%) than in banner ads (58%), a phenomenon that Benway (1998) termed "banner blindness." Benway thought it was ironic that while these banner ads were designed to be distinctive and salient compared to the other content on the website, people still paid little attention to them. She suggested that the reason could be users' learned experience with advertisements because they do not see them as a source of information and ignore them when searching for information on websites. Therefore, the more people ignore ads, the more ads will probably be needed to make up for the lost revenue. Google used to recommend publishers display 3 ads-per-webpage, but in 2016 they removed that policy and suggested focusing on content-ad ratio

and user experience instead (Marvin, 2016). With that recent change there is no limitation on how many ads one can display on a webpage (Google, 2023). Indeed, in 2016 Facebook had 10 to 12 million active ads daily (Lynley, 2014), and that grew to 15 million by 2023 (Meta, 2023). The number of web advertisers also grew from 4 million in 2016 to 10 million in 2020 (Statista, 2020).

Benway (1998) suggested that important items on webpages should not be designed to be visually distinct from the other content on the page because users could think that those items are advertisements and would ignore them. Text advertisements are ads that are less visually salient and look similar to other content on webpages. In the following study, Owens et al. (2011) examined whether text advertisements are also affected by user "blindness".

Text Ad Blindness

Owens et al. (2011) studied text ads on webpages to determine whether users routinely ignore them like they do banner ads. This study was a valuable addition to the concept because while people may ignore banner ads due to their graphical appearance, text ads are less salient and more visually similar to content, so they might not be ignored as easily. In an eye-tracking study, Owens and colleagues (2011) examined how search type and ad location affected the degree of blindness. They asked 25 participants (10 male, 15 female; mean age: 23.5) to perform different search tasks (eight exact and eight semantic searches) in a mock Hawaii information website with 29 custom-built webpages. To perform the exact search task, participants had to find an actual target on the site and locate it by clicking on the area (e.g., click on the information about "wreckage of a 1950 Corsair"). For semantic search tasks, participants were asked to find some information that was not directly specified (e.g.,

"find information about dolphin activities"). Targets were located either in the content area of interest (AOI) or in the text ad AOIs (top and side ad areas). After the search trials, participants completed a task difficulty rating on a five-point Likert scale and were asked to sketch the layout of the website. In addition, they were tasked with filling out a post-experiment questionnaire that collected information about participants' ad recall, ad location, and search strategies for the two search tasks.

Owens et al. (2011) found evidence for text ad blindness. The result showed that when participants were searching for information on webpages they were less successful in finding targets in advertisement-related locations (top ad (52.9%), and side ad target (36.8%) locations) than in the content-related locations (82%). The result suggested that users ignored areas where text advertising was traditionally located when searching for information. Data (e.g., task success, fixation duration, AOI rank order) collected through eye-tracking and questionnaires supported the hypothesis of text ad blindness. Users habitually ignored areas where ads were located, and searched the top and right side of the webpage last because they knew from experience that text ads were located in that area.

In a follow up study, Owens et al. (2014) examined whether text ad blindness would still exist when the layout of the website changed from standard to nonstandard. For example, they moved the ads from the website's right hand side to the left. Also, the study aimed to establish whether text ad blindness was a result of where the ads were located (top ad, right ad, left ad) or their visual design. The results indicated that text ad blindness is influenced by both the position and the physical characteristics of the ads. They also discovered with their eye-tracking study that participants fixated first on the content part of the website, then on the

top ad region, and later on the side ad. Similarly, eye-tracking research conducted on both mobile and desktop websites by Nielsen (2006) and Pernice (2017) found that participants' reading patterns follow an ‘F’ shape. Typically, users start reading from the top left and move horizontally to the right in the content area, forming the first line of the letter F. Then they move lower on the page and scan in a shorter than previous horizontal direction, forming the second line of the F letter. After that participants tend to scan only the left side of the content. Thus, participants have a tendency to review the top part of the page more rigorously than other parts of the site. It also aligns with the general reading pattern that people use: left to right and top to bottom. So, while people scan a document in an F-shaped pattern they perhaps are looking for important information. When they find the important clue they engage even more or stop reading.

The phenomenon when someone terminates a search after finding relevant information is called “Satisfaction of Search.” It is defined as a “decrease in detection rates for a subsequent target when an initial target is found” (Adamo et al., 2021). It could be disruptive when people proofread (Barach et al., 2021), scan through a radiological image (Tuddenham, 1962), or search for a rare item (Wolfe et al., 2005) in an image. Since people use the pattern of reading top to bottom while scanning a website or a social media news feed users could stop reading. Thus, while people search for multiple targets and find one or two they could become “satisfied” and terminate their search (Fleck et al., 2010). Since people search from top to bottom it is possible they would often terminate a target search before they reach the bottom, thus targets located in the bottom position are less likely to be discovered.

In addition, Owens et al. (2014) found participants started to ignore the left region containing text ads in the nonstandard website layout after the third trial (about 90 seconds), and they developed more prominent text ad blindness in the nonstandard than in the standard website condition. Thus, participants not only learned the new location of the ads but paid attention to their physical design as well. Owens et al.'s (2014) findings showcased how persistent text ad blindness could be, and how a user alters their behavior and adapts to a changing environment. Owens et al. (2011, 2014) suggested not to change the layout of the websites and that website operators place advertisements closer to the content area. Thus, ads would be more likely to be viewed. In 2013, Facebook moved ads to their social media news feed where it is displayed among content (Felicitas, n.d.).

Mobile Advertising and Social Media

In 2022, there were 5.48 billion unique phone users and 5.07 billion internet users globally (DataReportal, 2022). Social media platforms, in particular, have proven to be an effective tool for communication, and are one of the most popular online activities. In 2021, 97% of Americans had a cellphone, and 72% of the population used some type of social media on their mobile device (Pew Research Center, 2021). Based on a 2021 survey, people most commonly use social media to connect with friends and family, read news, and fill their extra time (Statista, 2021). Social media apps like Facebook and YouTube are the most popular among American users. For users born between 1997 and 2013 ("Generation Z" or "Gen Z") and between 1981 and 1996 (Millennials), YouTube (95%) is the most popular app, followed by Instagram (71%), Facebook (70%), Snapchat (65%) (Auxier & Anderson, 2021). These networking sites are created with the intention of engaging in conversations,

discovering communities with similar interests, viewing images and videos, and following businesses.

Advertisements in Social Media

Social media apps on smartphones are great tools for businesses to reach their potential customers by placing ads among social media content posts. With new machine learning techniques, ads can be recommended based on the users' interest to increase the CTR. Advertisements are also necessary for companies that offer free access to their services. Companies with limited or no revenue from advertising offer their services for a monthly or yearly subscription fee. Social media platforms are free for everyone to use, meaning that they must have ad revenue to subsidize the service. Without the support of other businesses' advertisements, social media sites would not be able to develop new features and keep their business profitable. Allowing companies to place ads on social media generates billions of dollars in revenue every year. According to the IAB's report, in 2021, US internet advertising revenue was $189 billion, with social media advertising accounting for 31% ($57.7 billion) (PwC, 2021).

Businesses and their advertising budgets are shifting towards mobile users, with the annual mobile internet advertising revenue being $135.1 billion compared to $54.2 billion from desktop PCs in 2021 (PwC, 2021). Mobile ad revenues are generated on smartphones and tablets (PwC, 2021). Meta (formerly known as Facebook) is a major player in generating social media advertising revenue. In 2022, the company's US yearly revenue was around $116.6 billion (Meta, 2022). In 2021, 97% of the yearly ad revenue came from mobile devices (Lebow, 2021). Data shows that mobile devices bring the most annual internet ad

revenue to the table. Yet users' perception of advertising on social media has rarely been studied on smartphone and tablet devices. Even though advertisements on social media are a significant source of revenue, users may experience *ad blindness*.

Ad Blindness in Social Media

Barreto (2013) examined whether users look at Facebook's advertisements and found evidence for banner blindness on the desktop version of the website. In addition, they compared paid advertisements with friends' recommendations to see which posts were engaged more. In an eye-tracking study, Barreto asked 20 participants (10 male, 10 female) between ages 19 and 55 to free-browse their own Facebook website. The researchers wanted to see if participants would interact with ads or not. In another task, they asked participants to visit the Nike sports brand page and look at the advertisements. After the tasks, participants filled out a social media consumption questionnaire where they reported their Facebook use habits. The researchers used fixation time as the dependent variable; and ad display, an ad seen, a recommendation seen, and recommendations clicked on as independent variables. The researchers found that users only fixated on 140 of the 746 banner ads they encountered. On the Facebook social site, participants came across 254 banners, of which they looked at 65, but only 10% of users clicked on any ads. The Nike brand website received even fewer interactions. Users were exposed to 30 ads but only fixated on one, on average. The survey also showed that users had little interest in viewing and interacting with the banner ads.

Though the Barreto (2013) study had high external validity, one weakness of this research was the stimuli design, which compromised its internal validity. Participants used their own social media accounts, which prevented all users from having the same experience.

It is hard to measure and compare findings when the stimuli are different across participants. In this case, participants could have seen more or fewer ads when they visited their personal accounts. Designing a mock Facebook website and ad placement would control the stimuli for all participants.

Barreto (2013) concluded that commercial advertisements attracted less attention than friends' recommendations on the social media platform. They explained that users focus on the content area on the website, and advertisements are further from the area where content and friend's posts are usually displayed. The authors suggested moving ads closer to the content area, which Facebook did in the following years. This study was done in 2013 when Facebook had not yet introduced advertisements to its news feed (the main area on Facebook where friends' posts appear). This research also shows that users ignore advertisements on Facebook's traditional desktop website layout, which explains why Facebook moved the ads to the news feed in an attempt to increase CTR. The majority of the users worldwide (81.8%) engage with Facebook only through their mobile phones instead of their computer (a mere 1.5% engage on computers only) (Hootsuite, 2022) Ads mixed in the news feed with user content allows Facebook to provide a more seamless user experience on mobile apps. These new types of advertisements that are displayed among the content are called *native advertisements*.

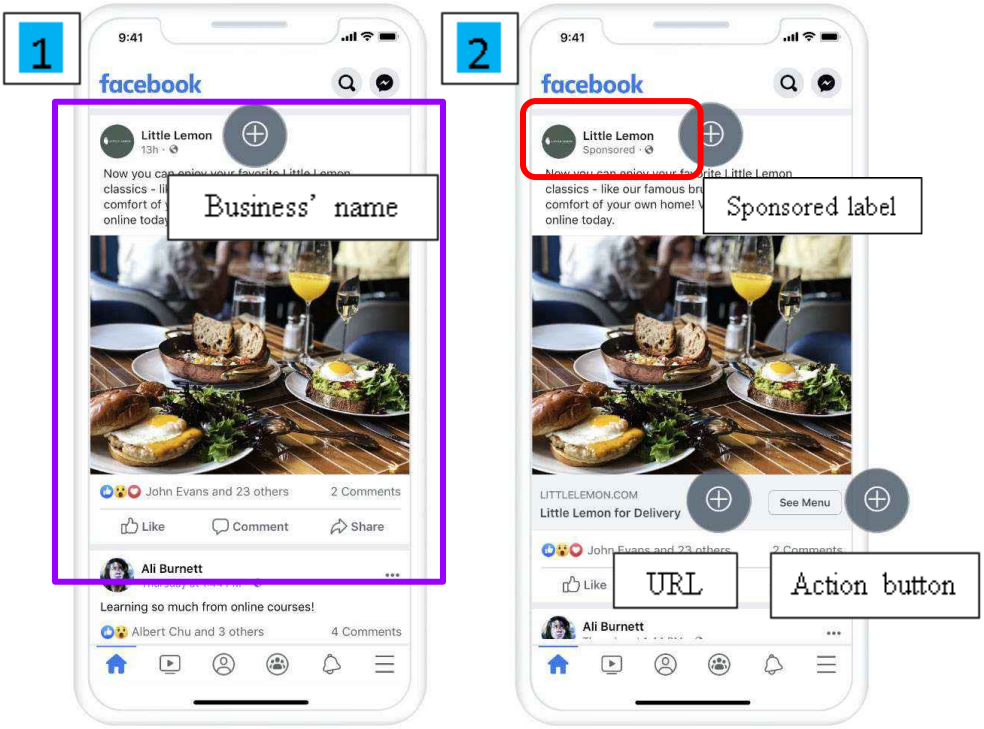
Native Advertisements in Social Media

Native advertising "is paid advertising where the ad matches the form, feel, function, and quality of the content of the media on which it appears" (Laursen & Stone, 2016, p. 5). This advertising form appeared around 2011 when smartphones started to show a significant gain

on other forms of entertainment and advertisement channels (TV, radio, newspaper). People use their phones on the go, but banner ads did not look appealing on a small screen and interrupted the flow of the content. Native ads are the perfect solution to serve ads on a small screen. On social media apps, native ads are the only form of advertisement, and they are embedded in the news feed (see Figure 3) as a sponsored news article or sponsored ads compared to the website version (see Figure 4), where they are on the right side, and also embedded to the news feed.

Figure 3

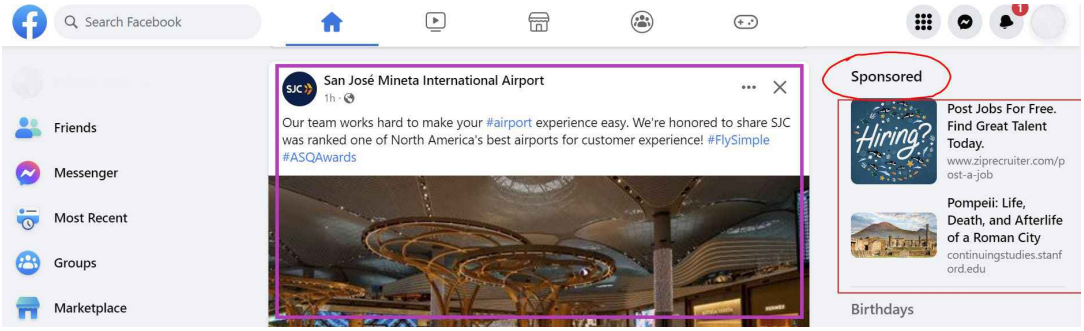
Example of Content Post and (Native) Ad Post Displayed on Mobile App



Note. Content post (image 1) and ad post (image 2) displayed on the Facebook app. The gray circles are marking the main areas that differ: sponsored label, URL, and action button. From *Create Ads from a Facebook Page*, by MetaBlueprint, 2022 (https://www.facebookblueprint.com/student/activity/212723?ref=cms_redirect).

Figure 4

Example of Content Posts and Ad Posts Displayed on a Facebook Website



Note. Content post (marked with a purple rectangle) in the news feed and ad post (marked a red rectangle) on the right side of the news feed on the Facebook website. The website image is a screenshot of my private Facebook page.

Sponsored ads are advertisements that businesses or individuals pay to place on various online platforms, such as search engines, social media, or websites. These ads are typically labeled as "sponsored," "promoted," or "ad" to distinguish them from non-paid content. On social media platforms like Facebook, sponsored ads appear in users' news feeds and are marked as "Sponsored" or "Ad." These ads are often targeted to specific demographics, interests, or behaviors. Sponsored ads are an effective way for businesses to reach their target audience and promote their products or services (DeFazio, 2020; MetaBlueprint, 2022). Native ads are designed to take on the visual form of the content and only have subtle design differences compared to other types of content (posts, articles) that are surrounding them (Pogue, 2015). For example, native ads often have a 'Sponsored' text tag below the advertiser name (see Figure 3, image 2), a call to action button (e.g., "Learn More" or "Shop Now"), and a website link below the ad picture. Thus, users must make even finer perceptual distinctions about what an ad is and what is content.

Until the beginning of the 2010s, Facebook did not allow advertisements to appear embedded in users' news feeds. However, around 2013 it started to use that space to target

users with native ads (Felicitas, n.d.) They are often displayed to users who have shown an interest in similar products or services, based on their search history, browsing behavior, or demographic information (MetaBlueprint, 2022). There is more research that needs to be done on how native ads affect user impressions of social media advertising and to explore whether ad blindness is present on mobile social media apps.

Maslowska et al. (2021) examined whether users' attention to social media ads would change when they saw an ad with or without consumer recommendations and whether the type of device (mobile versus desktop) mattered. They collected and compared data from both mobile and desktop devices with eye-tracking methodology. Previous studies (Dunaway et al., 2018) found shorter attention allocation on mobile and tablet versus desktop computers with the use of eye-tracking. Due to that finding, Maslowska et al. (2021) hypothesized that participants would pay more attention to ads displayed on a PC rather than on a smartphone.

For the stimuli design, Maslowska et al. created a scrollable mock Facebook news feed with 19 posts that was a mix of social posts, news, political issues and one ad that they created for this study. The posts had a fixed order and the ad they created was always the fourth post to prevent primacy and recency effects. However, a random order of the posts would have been a more advisable approach because that would elevate the statistical power of the desired treatment effect. They optimized the news feed for mobile viewing to have a natural and familiar layout for users. The participants' (n=121) task was to scroll through the news feed as if it was their own. They had no time limit on how long they could browse the posts but rather followed their natural behavior.

Maslowska et al. (2021) found that there were no significant differences between the two devices (mobile versus desktop) or the two types of ads (i.e., recommendation versus no recommendation). They suggested that the result of the lack of participants' attention to recommendations could be explained by ad blindness because participants did not look at (fixate on) the ads for long.

Along the same lines, Bode et al. (2017) examined political information avoidance in the news feed on a mock Facebook website on a desktop. They asked participants to use and interact with the posts as if it was their own Facebook account. They included a variety of personal, social, and political posts in the mock news feed. With eye-tracking, they determined how much time participants spent reading political posts, and they measured what the last words were that people fixated on before they looked away from the ad with political cues. Political cues are words the researchers placed in posts; for example, the name of a political party, a political figure, or policies. The researchers tracked the location of the first political cue and the number of political words appearing in the text. Then they analyzed when participants stopped looking at the political post and moved their eyes to another post. The results showed that users could sufficiently identify political posts after the first political cue appeared in the post. Additionally, if someone had a low interest in politics, they tended to skip the post as soon as any political word was fixated on. Interestingly, however, people in the study liked to read posts that attacked political figures or ideas.

Bode et al. (2017) found that the later readers fixated on a political cue, the longer they looked at the post. They suggested that advertisers could improve their political ads by

introducing political words later in their ads, preventing Facebook users from skipping the political content too quickly.

To summarize, in desktop applications, people can avoid information such as ads because they generally have a distinctive design and location on a website (Owens et al., 2011, 2014). However, Facebook has incorporated ads into its news feed content; thus, the location distinction that people use to easily identify ads has been eliminated. Such native ads are designed to blend well with the other content, so users would not skip over them too quickly. Regardless, users have learned to identify, avoid, skip over, and not click on non-informative elements (Bode et al., 2017; Owens et al., 2014), such as ads (e.g., political ads) they are not interested in, resulting in ad blindness.

Ad blindness is a phenomenon in which users of social media apps actively avoid looking at or engaging with digital ads, resulting in low CTRs and wasted advertising budgets for businesses. As social media advertising becomes increasingly prevalent, it is essential to understand users' impressions of social media ads on mobile phones. Ad blindness suggests that people automatically ignore ads (Barreto, 2013; Benway, 1998; Owens et al., 2011), and one theory postulates this occurs due to *habituation* (Portnoy, 2012). Habituation is a general phenomenon that could provide a mechanism that explains ad blindness.

Habituation and Advertisement Blindness

Habituation is a phenomenon that occurs when repeated presentations of a stimulus reduce a response (Harris, 1943). It is regarded as the simplest form of learning and a behavioral process that stays with organisms due to their phylogenetic history (Pierce & Cheney, 2017; Thompson & Spencer, 1966). Learning is an organism's behavior alteration

due to lifetime events. There are two types of learning: associative and non-associative learning. Non-associative learning is a type of learning with no modification between a behavior and a stimulus, and it is not dependent on stimulus pairings (Pereira & van der Kooy, 2013). One of the forms of non-associative learning is habituation, which is defined as a behavioral response reduction due to repeated presentation of a stimulus that is not a result of motor or sensory adaptation or fatigue.

Researchers think habituation is needed to filter out unimportant information and to focus our attention on meaningful stimuli. To understand habituation and the building blocks of learning, Groves and Thompson (1970) created the dual-process theory of habituation. They postulated that a stimulus results in two independent processes that interact: habituation (decreased response) and sensitization (increased response) (Groves & Thompson, 1970; Thompson, 2009). Sensitization is regarded as dishabituation, which refers to the presentation of a different stimulus that enhances the previously habituated response to the original stimulus.

Human factors researchers Kim and Wogalter (2009) applied dual-process theory to understand the effectiveness of visual warning signs. People often encounter visual warnings, and their warning effect decreases when they see them repeatedly. The authors sought to find empirical evidence for the effect of habituation on warning signs. Such research seems relevant for understanding ad blindness because both are visual stimuli, and people tend to habituate to them and eventually ignore them.

Kim and Wogalter (2009) recruited 72 participants (44 males, 28 females) and asked them to view two different warning signs that had the same content (text, picture, color) but

different formats (appearance). The task was to look at each warning sign for 4-5 seconds and rate their level of alertness prompted by the sign on a seven-point Likert scale. The result showed that when the warning format changed, there was an indication of the process of habituation, dishabituation, and recovery of habituation. Due to repeated exposure to the same format warning signs, alertness rating decreased - habituation occurred. An increase in alertness was only experienced by participants when the format of the warning signs changed. In addition, the authors were able to show recovery of habituation as well. To apply their research to real life, Kim and Wogalter suggested changing formats between warning signs and switching color and sizing to avoid the effect of habituation.

Similarly to warning signs, people get used to seeing ads on websites. Based on dual-process theory, social media advertisements may also be affected by habituation. Users see ads (stimuli) repeatedly on their social media platforms, and since they see them so often (about 70 advertisements per week; Galán et al., 2019), they stop paying attention to them. Therefore, in the past few years, websites have included more advertisements to compensate for this lost revenue (Maslowska et al., 2021). However, one important characteristic of habituation is that when a stimulus is more frequent, habituation becomes more rapid (Rankin et al., 2009). Thus, when a website displays more ads, people will pay even less attention to them. Through the process of habituation, ad blindness could become automatic (Sun et al., 2013). Automatic refers to a process that becomes active "without the necessity for active control or attention by the subject" (Schneider & Shiffrin, 1977, p. 2).

Habituation is concerning for advertisers because it may cause people to avoid clicking on ads. Ads are frequently presented in a similar shape and form (native ads, reels, video

ads). Also many ads are presented in repetition to users. Galán et al. (2019), in a large-scale study conducted from Facebook ad data, measured the likelihood of an advertiser engaging a user to click on one of their ad based on the number of times the user is exposed to ads from that particular advertiser. They found that the initial advertisement display (first ad impression) had a slightly stronger ability to engage the user, whereas all additional displays had an equal probability of engaging the user. The more ads the user sees, the less they engage. From a business perspective, ad blindness means revenue losses and ignored messages. It affects not just for-profit companies but non-profit organizations as well. Their message is ignored by users in the same way as generic advertisements. Donation collection is difficult when people ignore the message due to ad blindness. From the users' standpoint, advertisements are perceived as intrusive and provide little information or entertainment value. These factors are affecting users' native ad avoidance and their skepticism toward them (Chung & Kim, 2021). Thus, businesses inject more ads that result in an even more crowded visual experience. For example, flashing banner ads increase perceived workload, and decrease search speed for users (Burke et al., 2005). While businesses are trying to provide good user experience, their most important measure is revenue.

The significance of social media in advertising is the motivating factor behind this research project. The question is whether advertisement blindness occurs in social media news feeds on smartphone apps. As previous research suggested, ad blindness (banner ad, text ad, social media ad) is prevalent in various shapes and forms on websites on desktop computers (Barreto, 2013; Benway, 1998; Owens et al., 2011, 2014) thus, it is probably the case in the app version as well.

Moreover, is search accuracy affected by target position? As earlier mentioned research discovered (Nielsen, 2006; Owens et al., 2011, 2014; Pernice, 2017), ads position and website reading layout affect where users deploy their attention. Users often attend ads at the top of the pages and search that section for information. Also, they start reading the content at the top and then continue scanning through the page down in both desktop and mobile phones. Thus, search accuracy is probably affected by target position.

In addition, we also want to find out whether ad blindness increases with expertise. The more time spent on social media and in contact with ads, the more users habituate to them. The appearance ("sponsored" label, link, and call to action button) and repetition habituate (Kim & Wogalter, 2009) and help users to learn to avoid the non-informative elements of the feed. We think that the generic phenomenon of habituation probably applies to social media feeds.

Present Research

The purpose of this study was to understand users' interaction habits with simulated in-app social media advertisements and to find evidence for ad blindness on smartphone applications. An additional goal was to examine whether there was a relationship between social media usage and ad blindness. To test these questions, we used a target search task (semantic) where participants browsed a mock scrollable Facebook news feed. Their task was to find set targets that appeared in both content and advertisement posts. Based on previous ad blindness research on website stimuli (Barreto, 2013; Benway, 1998; Owens et al., 2011, 2014), we anticipated that participants would experience more difficulty locating the target information in advertisements than in content posts. Moreover, in line with prior

research, we expected that participants would have higher accuracy in locating targets in the top positions than in the bottom positions (Nielsen, 2006; Owens et al., 2014; Pernice, 2017).

Ads in a Dynamic Context

Several studies examined different types of ads (banner ads, text ads, native ads) on social media websites in the past, but each study had methodological shortcomings. For example, Bode et al. (2017) used static pages as stimuli that each showed several posts. However, Voorveld et al. (2018) pointed out that static images used as stimuli would not resemble the natural way users interact with their social media platforms because ads on social media are displayed among other posts, and the overall experience of the context matters. To apply a different approach, Windels et al. (2018) asked participants to use their own social media accounts in the study (similar to Barreto, 2013), but when the stimuli were different across participants, it limited internal validity (Maslowska et al., 2021). Learning from these previous experiments, Maslowska et al. designed an experimental stimuli that allowed for a more realistic experience of social media ad interaction and created a mock Facebook news feed that let participants scroll through the stimuli the same way they would with their own news feed. The present research follows the Maslowska et al. (2021) stimuli design but applies it only to a mobile phone interface. This study is the first attempt to explore ad blindness on a scrollable dynamic news feed on a smartphone where participants use and test stimuli as if it was a real social media news feed.

Operationalizing Variables

Post type, an independent variable, is defined as a communication piece from a social media application that represents either content or advertisement elements. Target position,

another independent variable, is defined as the location of the information needed to be found by the participants, and it could be located in the top, middle, or bottom part of the mock scrollable Facebook news feed. Accuracy, the dependent variable, is defined as the proportion of the total number of correct target identifications and calculated from the number of targets identified divided by the total number of targets. Expertise, a continuous variable, was measured by the computed Facebook Intensity (FBI) Scale scores (Ellison et al., 2007) by calculating the mean of all the items on the scale. Expert users scored higher, and novice users scored lower on the FBI.

Hypotheses

Hypothesis 1: Participants will identify targets more successfully in content posts than in ad posts.

Hypothesis 2: Targets will be located more accurately in the top positions than in the bottom positions.

Hypothesis 3: The percent correct difference between content posts and ad posts (i.e., magnitude of ad blindness) will be the largest in the bottom position.

Hypothesis 4: Social media usage correlates positively with advertisement blindness (defined as the percent difference in search task success between targets in content vs. advertising posts).

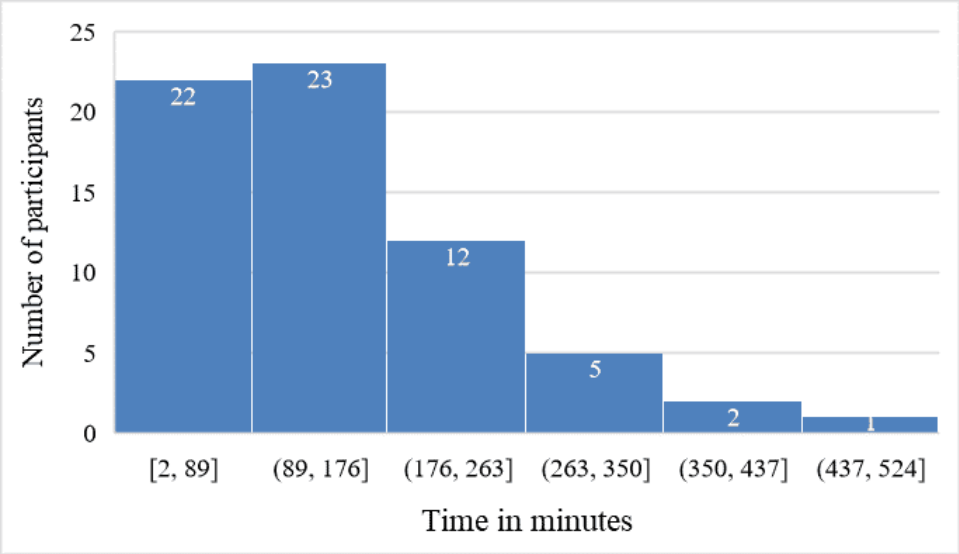
Method

Participants

Participants were recruited from the San Jose State University's (SJSU) Department of Psychology SONA participant pool and through word-of-mouth. SJSU students who signed up through SONA received course credit for participating. Everyone provided informed consent before they started the study. Participants were a mix of college-aged ,students and older adults; the mean age was 25 years (SD = 9.6). Out of the 65 participants, 45 were female, 19 were male, and one identified as non-binary. They reported that, on average, they spent more than 120 minutes per day on social media, which is similar to what other questionnaires have reported (Statista, 2022). Figure 5 depicts the time social media was used per day by participants.

Figure 5

Histogram of Time Spent on Social Media in Minutes



Note. On average, 135 minutes (2 hours) are spent on social media per day. The x-axis shows the time in minutes, and it is displayed in bins. The bins have square brackets ([...]) meaning closed interval and parentheses ((...)) meaning open interval, and half-open interval ((...]) only includes one of the endpoints.

The sample size was calculated with G*power 3.1 software. It recommended a minimum of 44 participants to perform a within-subject analysis of variance (ANOVA) with an effect size of 0.17, alpha = .05, and a power = 0.8. Also, a one-tailed Pearson r correlation with an effect size value (.4), alpha = .05, and a power level of 0.8 was run. For the Pearson correlation, $N = 46$ sample size was recommended. A larger than suggested sample size (N=65) was included to account for possible technical difficulties and for participants who might leave the study without completing all the tasks.

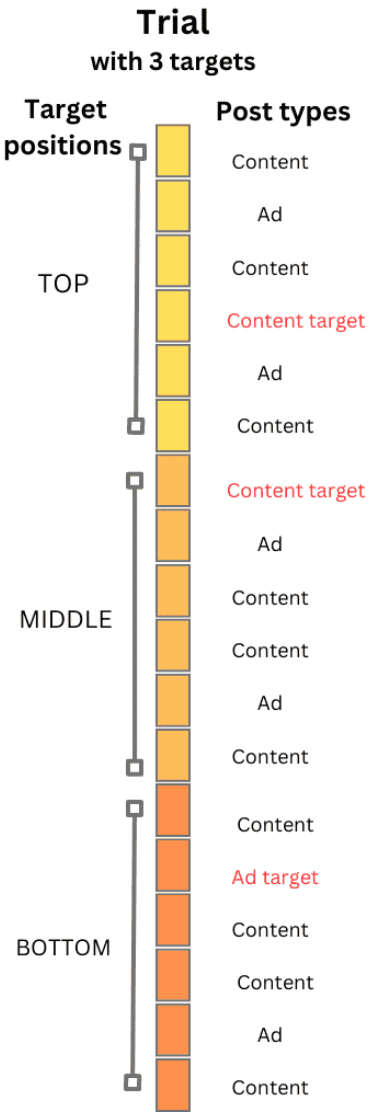
Participants needed to have a Facebook account (i.e., active or deactivated) to meet the inclusion criteria for the present study and also needed to fill out the informed consent statement to participate. Participants who failed to find only one target in three or more of the 18 trials were excluded. Those who failed the two attention check trials or completed the study unreasonably quickly (in less than six minutes) were also excluded. Exclusion criteria removed 35% of all data.

Materials

Maslowska et al. (2021) found that 19 posts allowed their participants to have a natural scrolling experience without overwhelming them. Informal observation of Facebook news feeds over five days showed an average of five (5) ads within the first 19 posts. Ads were spread in a set pattern across the news feeds: content post, ad post, and after that, every fourth post was an advertisement. In order to have a balanced study, we used 18 posts (six [6] ads and twelve [12] content posts placed in an order of: first post was a content post, the second was an ad, and after that, every third post was an advertisement [see Figure 6]) in the

Figure 6

Example Trial with Three Targets Located in the Three Different Positions (Top, Middle, Bottom)



Note. The image depicts the design outline of a trial (stimuli 11) from the study section. In this example trial, there are three targets randomized across the three locations (top, middle, and bottom) at posts 4, 7, and 14. Every position had six posts (ad and content). See full trial images (with 18 posts) in Appendix H.

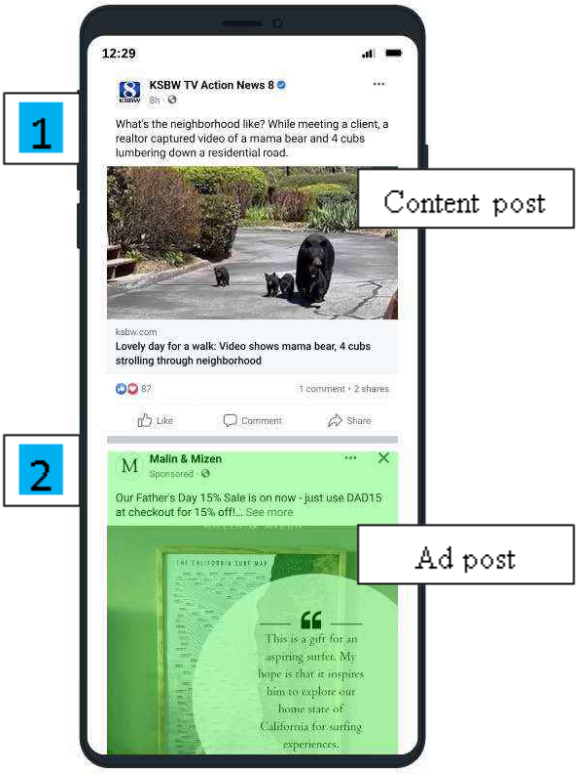
news feed to allow even distribution of advertisements and content posts throughout the stimuli.

Similarly to previous studies (Owens et al., 2014), there were 18 trials and 3 practice trials, and 2 attention checks for a total of 23 trials. In the two attention check trials, participants needed to highlight a number of posts (5) to measure their attention. The experimental stimuli consisted of screenshots from real Facebook news feed posts: 378 individual screenshots (324 for the study and 54 for the 3 practice trials) were collected from my private Facebook news feed. Screenshots of publicly available real news feed posts (e.g., news articles, brand or social service announcements) were used for the stimuli. The screenshots were stitched together vertically with IrfanView 64 4.62 software. The stimuli were uploaded to Qualtrics (www.qualtrics.com). The hot spot survey question type was used for the trials to predefine regions - AOIs - in every image with a rectangle that participants could click to select posts containing targets. When they selected a post, it turned green (see Figure 7). Stimuli displayed on a smartphone in Qualtrics allowed for a more realistic browsing experience, similar to the actual Facebook mobile interface.

Design

There were 23 trials in the study and each trial contained 18 posts (images), with the 63 targets (42 content targets and 21 ad targets) counterbalanced across trials and positions (top, middle, and bottom areas) of the news feed. There were also a varying number of targets in each trial (i.e., two [2], three [3], or four [4] targets per trial).

Figure 7
Example of a Content and Ad Post Stimuli



Note. Example of Facebook post stimuli: one content post (number 1) and one advertisement post (number 2) that is highlighted in green as a selected answer in Qualtrics (www.qualtrics.com) displayed on a smartphone.

Post type was one of the independent variables. The posts could be an advertisement or content, organized in a way that closely followed the natural display of a real Facebook news feed. For example, in one trial, the first post type was content, then an ad, then two contents, one ad, and one content. This outline repeated two more times in one trial totaling 18 posts. There were twice as many targets appearing in content posts as in advertising posts.

Target position was another independent variable. Targets could be located in the top, middle, or bottom part of the mock scrollable Facebook news feed. All three positions

contained 6 posts per trial, as described above (see Figure 6). Across the entire study (excluding practice and attention check trials), the top, middle, and bottom positions each had 108 posts that included 18 targets, for a grand total of 54 targets.

Accuracy was the dependent variable, and was defined as the proportion of the total number of correct target identifications and was calculated from the number of targets identified divided by the total number of targets.

Expertise, a continuous variable, was measured by the computed FBI Scale (i.e., bipolar scale) scores (Ellison et al., 2007).

Procedure

First, participants signed up through SJSU's Department of Psychology's SONA system website to participate in the study. The study was available online, and participants could sign up for open slots. When starting the study, they were navigated to Qualtrics (www.qualtrics.com). The screen displayed instructions for filling out the informed consent form on their phone. After completing and agreeing to participate, they received instructions such as that all social media posts that they saw on the social media news feed (both content and advertisements) could be highlighted with a click or tap and the post turned green. To change their response and unselect a highlighted post, they needed to click on that post again to make the green highlight disappear. Also, participants were informed that they could select multiple target items (between 2 and 4) at any location (top, middle, bottom) throughout the scrollable feed.

Participants completed three practice trials where they received feedback to ensure that they understood the task. The analyses excluded the training session data. After the practice

trials, participants had a 15-second break before receiving an instruction on the screen to begin the task. The task had 20 trials (18 experimental and 2 attention checks), and each trial showed a scrollable news feed with 18 posts. Following previous research (Owens et al., 2011, 2014), a semantic search task on the top of the page was provided. For example, **"***You and a friend are planning to travel in the near future. Select every post that is related to travel*." A preliminary test showed that 60 seconds per trial was plenty of time to read and scroll through the 18 posts and click the travel-related posts. Multiple target posts that could fit the prompt were arranged in a counterbalanced fashion in the top, middle, and bottom areas of the dynamic news feed to reduce order effects. Participants were not able to go back to previous trials to change their selection. When they finished all trials, participants took a brief questionnaire, the FBI Scale (Ellison et al., 2007). This scale measured participants' Facebook usage and expertise with the platform (see Appendix B). Once they completed the FBI survey, they were asked to fill out a brief demographic questionnaire (see Appendix A). Participants were thanked for their participation and debriefed after the study. The entire study took approximately 45 minutes to complete.

Pilot Study

Target difficulty could be a confound, so a pilot test on target post difficulty was run before collecting any data. The potential 63 targets (54 study targets and 9 training targets - content posts and ad posts) were tested by showing them individually to two participants (one male Facebook user, 20 years old, and one female Facebook user, 35 years old). The participants were asked to categorize the posts into topics (e.g., travel, cooking, gardening, etc.) using Qualtrics (www.qualtrics.com). Data were evaluated for interrater agreement, and

the study trials only used posts for targets that reached agreement among the two test participants. When they did not agree, the target image in the first round was omitted. The two participants were asked again in the second round to rate the new stimuli, and a third participant (male, age 29) was used to break any ties.

Analytic Approach

We conducted a repeated-measures ANOVA to assess the proportion of correct data and evaluate the first three hypotheses. We performed an arcsine transform of the proportion of correct data to avoid violations of sphericity. The alpha level was set to .05. First, we completed the assumptions checks necessary to interpret an ANOVA. Mauchly's test was used to test sphericity, and Greenhouse - Geisser correction was reported (i.e., degrees of freedom reported as not a whole number) if the sphericity assumption was violated. Three omnibus tests were performed: the interaction effect, the main effect of a post-type test, and the main effect of the target location and Bonferroni adjustment were used to correct for Type I error.

The second analysis was a Pearson correlation between ad blindness magnitude (i.e., defined as the percent difference in search task success between targets in content vs. advertising posts) and expertise (experts and novices) measured by FBI score. The Shapiro-Wilks test for normality was used after checking linearity, which showed that the test met the assumption. JASP version 2021.09.02 was used to execute all the assumption checks and statistical analyses. Table 1 shows the analytical test for each hypothesis.

Table 1
Summary of the Statistical Analysis Plan

H	Hypothesis	IVs	DVs	Statistical Test	Effect Size
1	Participants will identify targets more successfully in content posts than in ad posts on a mobile application.	Post type (advertisement, content)	Accuracy	ANOVA	η_p^2
2	Targets will be located more accurately in the top positions than in the bottom positions.	Target position (top, middle, bottom)	Accuracy	ANOVA	η_p^2
3	The accuracy difference between content posts and ad posts will be the largest in the bottom position.	Post type (advertisement, content); Target position (top, middle, bottom)	Accuracy	ANOVA	η_p^2
4	Social media usage correlates positively with advertisement blindness.	Post type (advertisement, content)	Facebook Intensity Scale (FBI) score; Ad Blindness Magnitude	Pearson correlation	r^2

Results

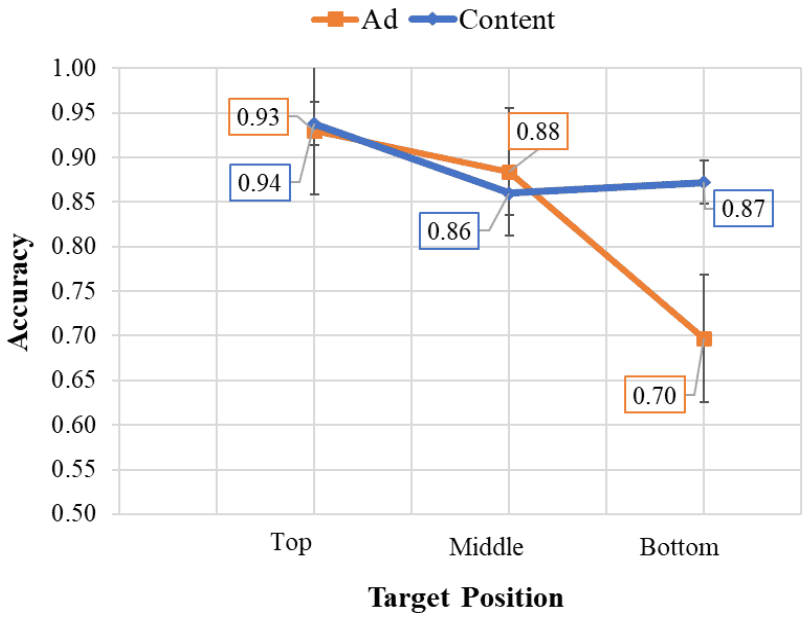
This study aimed to determine whether advertisement blindness is present in social media applications by asking participants to find target information among the content and advertisement posts. In addition, the study examined if the target position would make a difference in finding a target. Also, it investigated whether there is a relationship between social media use and advertisement blindness.

Advertising Blindness Analysis

The accuracy results for the two-way ANOVA is depicted in Figure 8. To evaluate hypotheses 1 - 3, a 2 (post type [advertisement, content]) x 3 (target position [top, middle, bottom]) within-subjects ANOVA was performed to assess if there were main effects of post type or target position, or a two-way post type x position interaction effect.

Figure 8

Accuracy of Identifying Targets in Different Post Types in Different Locations



Note. The graph displays the accuracy of identifying targets in different post types in different locations. Error bars show the standard error of the mean.

The result showed that there was a significant main effect of post type, $F(1, 64) = 4.60$, $p = .036$, $\eta_p^2 = .07$, indicating that there was a reliable difference in identifying targets in content and ad posts. Additionally, the analyses detected a main effect of target position, $F(1.8, 117.2) = 56.06$, $p < .001$, $\eta_p^2 = .47$, indicating a significant difference in locating targets in different positions. Also, a reliable interaction of post type by position was found, $F(2, 128) = 17.44$, $p < .001$, $\eta_p^2 = .21$, suggesting that performance on content versus ad posts showed different patterns as a function of position.

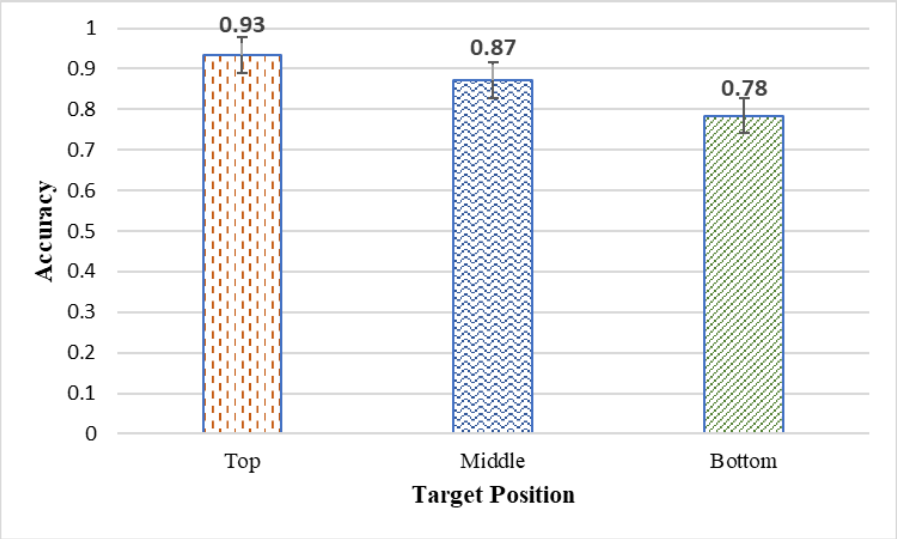
The significant main effect of post type provides evidence for Hypothesis 1, that participants will demonstrate ad blindness in this study. Participants had a significantly higher success rate of identifying targets in content posts ($M = 0.89$, $SD = 0.072$) than in ad posts ($M = 0.84$, $SD = 0.106$).

The mean success rates for the three positions is shown in Figure 9. The significant main effect of target position supports Hypothesis 2, which predicted that participants would locate targets more accurately in the top positions ($M = 0.93$, $SD = 0.09$) than in the bottom positions ($M = 0.78$, $SD = 0.19$). Planned analysis determined that all three conditions (top, middle, and bottom) were significantly different from each other, all $t(128) \geq 5.08$, all $p_{bonf} \leq .001$, all $d \geq 0.53$.

Hypothesis 3 predicted that the ad blindness effect would be largest in the bottom position. Exploring the significant interaction effect of post type and target position, planned comparisons revealed that the only significant accuracy difference was between content posts in the bottom position ($M = 0.87$, $SD = 0.11$) and ad posts in the bottom position ($M = 0.69$, $SD = 0.22$), $t(126) = 5.99$, $p_{bonf} < .001$, $d = 0.96$.

Figure 9

Mean Success Rate in Different Locations



Note. The bar chart depicts the average success rate in the three different target positions. Error bars display the standard error of the mean.

Correlation Analysis

The correlation between ad blindness and social media use is visible in Figure 10. A Pearson correlation was performed to determine whether social media usage (FBI score) correlates positively with advertisement blindness magnitude. The result showed that the correlation between the variables was not statistically significant, $r(63) = -0.09$, $p = .46$, $r^2 = 0.008$, 95% CI [-0.33;0.15]. Therefore, we did not observe a significant linear relationship between Facebook usage and advertisement blindness.

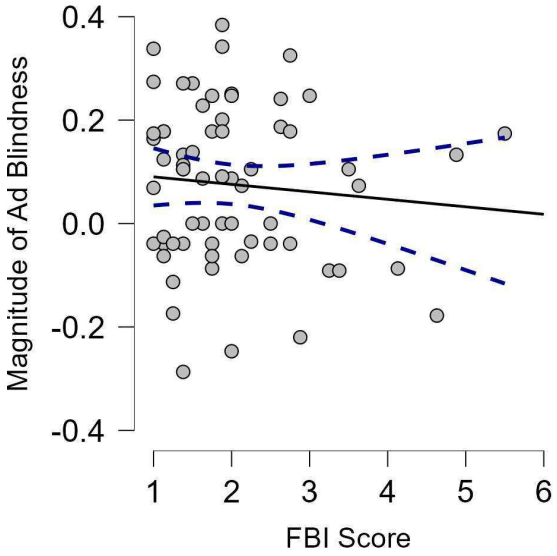
Exploratory Analyses

Group Differences

To have a sample that was diverse in age, participants were recruited both from SJSU's Psychology Department subject pool (SONA) and through word-of-mouth (public). While recruiting participants through word-of-mouth, SJSU associations were asked to share flyers

Figure 10

Magnitude of Ad Blindness by FBI Score



Note. Scatter plot depicts the relationship between magnitude of ad blindness by FBI score. The two variables were not related $r(63) = -0.09$.

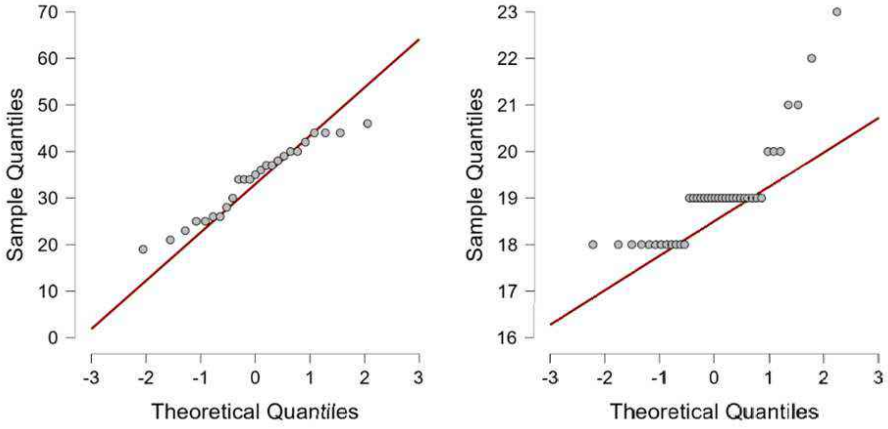
on their social media pages, flyers were distributed in SJSU's buildings, and recruitment information was shared online in Facebook social groups. Through this recruitment method, 50 participants signed up for the study. After applying the exclusion criteria, N=26 participants were left. They were 77% female, and their mean age was 34.77 (SD = 8.97). In contrast, 50 students from SONA participated and 39 produced clean data. Their mean age was 19 (SD = 1.12), and 66% were female.

The two samples also differed in education level and ethnicity. In the public sample, 46% finished their BA and 42% had a graduate or professional degree. The three biggest ethnic groups in that sample were: White (35.7%), Asian (25%), and Hispanic/Latino (21%). In the SONA sample 56% reported having some college, and only 5% finished their BA (usually undergraduate students participate in the psychology pool for credit). Their reported ethnicity was: Two or more ethnicities (30.8%), Asian (30.8%), and Hispanic/Latino (20.5%).

The demographics differed between these two sub-populations and informal analyses indicated that performance may have differed, therefore we conducted more rigorous exploratory analyses investigating whether performance in the two samples was actually different.

T-Tests. First, normality was reviewed for the two groups and the Shapiro-Wilk test found that the SONA group deviated from normal distribution (see Figure 11). One outlier (age: 57) three standard deviations from the mean was removed from the sample. A non-parametric independent t-test (Mann-Whitney U) was performed on age and indicated that the public group (Mdn = 35) and the SONA group (Mdn = 19) age were significantly different from each other, U = 954.50, $p < .001$, $r_B = 0.96$, 95% CI [0.93; 0.98].

Figure 11
Distribution of the Public and SONA Sample Data



Note. Q-Q plot shows the public group (left) and SONA group (right). It is visible that the SONA group differs from a normally distributed sample.

The second test explored the difference in the two samples' FBI score. A few outliers (FBI score: 4.63, 4.88, 5.5,) were three standard deviations from the mean and were removed from the sample. The non-parametric independent t-test (Mann-Whitney U) found

that the public sample's (Mdn = 2.13) FBI score was significantly higher than the SONA samples' (Mdn = 1.5) FBI score, U = 672.50, p = .003, r_B = 0.45, 95% CI [0.19; 0.65]. The data revealed that the public group had a higher FBI score, which aligns with previous research that suggested older generations are more connected to Facebook than younger generations (Auxier & Anderson, 2021).

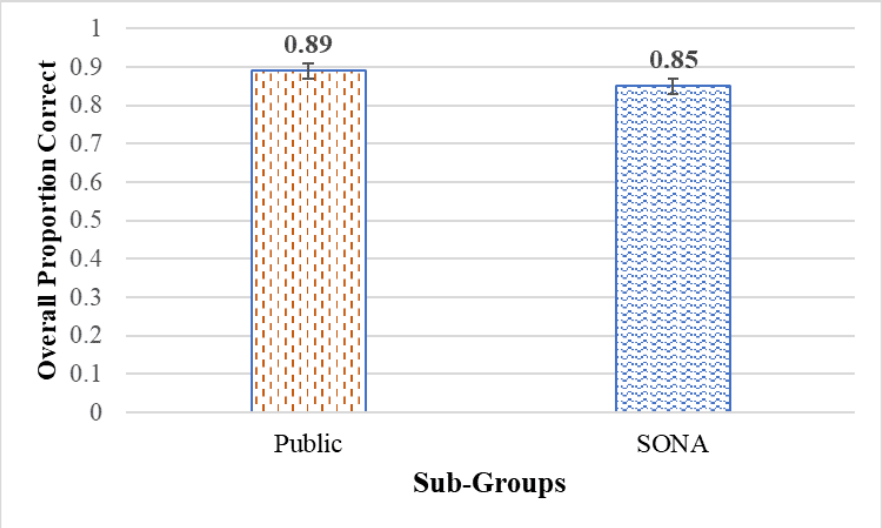
With the third t-test, the group's study completion duration difference was explored. Outliers 3 standard deviations away from the mean were removed, however, visual observation of the Q-Q plot still suggested several outliers. A t-test was performed with and without outliers. After taking a closer look removed outliers around and above a 1-hour duration time (duration in seconds: 179474, 3739, 7815, 4873, 9565, 5114, 4333, 4308, 3583). The result showed that the two groups did not have significant differences in duration, U = 403, p = .64, r_B = 0.078, 95% CI [-0.23; 0.37].

Mixed ANOVA. To investigate further whether there was a main effect of group, or whether there was an interaction effect of group by either of the other two variables, the two groups were added as another (between-subjects) variable to the previous within-subjects ANOVA model and a 2 (group[Public, SONA]) x 2 (post type[content, advertisement)] x 3 (target position [top, middle, bottom]) mixed ANOVA was conducted.

The result revealed that the additional between-subjects variable returned a main effect of group, $F(1, 63) = 5.88$, $p < .018$, $\eta_p^2 = .085$. Further examining the main effect of group, the public sub-group (M = 0.89, SD = 0.069) had higher performance overall, than the SONA sub-group (M = 0.85, SD = 0.078) (see Figure 12). Besides this observed main effect, the

Figure 12

Overall Performance by Sub-Groups



Note. The bar graph depicts the overall accuracy split by groups. Error bars represent standard error of the mean.

group variable did not interact with any other variables (e.g., post type or positions), thus the group difference did not bring any meaningful changes to the equation.

Surprisingly, the previously observed main effect of post type did not return a significant difference in this model in identifying targets in content and ad posts, $F(1, 63) = 3.29$, $p = .075$, $\eta_p^2 = .05$. The only difference between this model and the previously run ANOVA model was that the two groups were added as a between-subject variable. As a result of that addition, the more complicated model lost power and moved the result above the alpha (.05) level. Despite the loss of power in this model, the main effect of target position, $F(2, 126) = 52.79$, $p < .001$, $\eta_p^2 = .46$, and the interaction effect of post type by position continued to show significant differences, $F(2, 126) = 16.48$, $p < .001$, $\eta_p^2 = .21$.

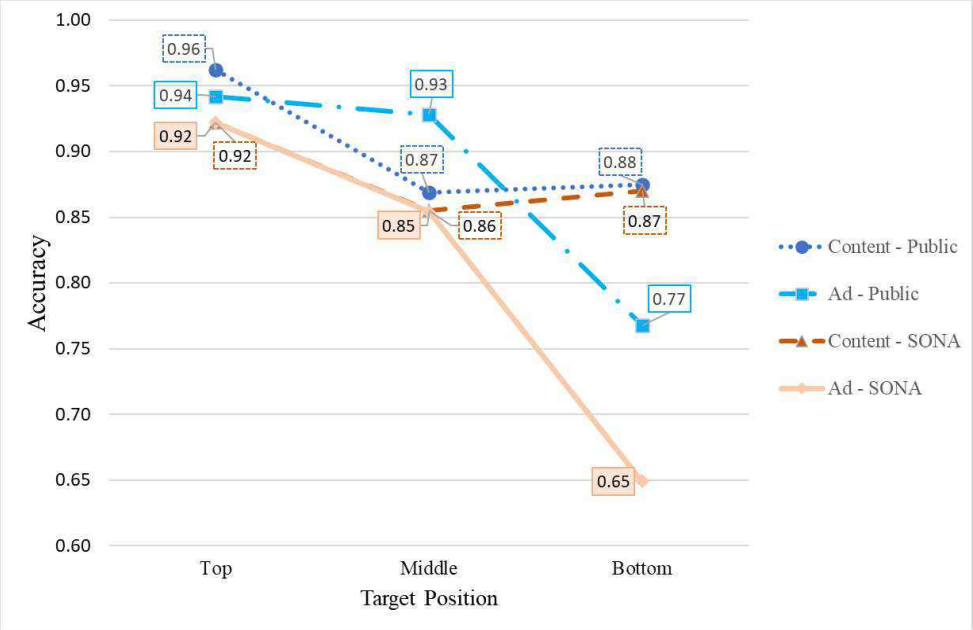
There was a significant main effect of target position and we predicted in Hypothesis 2 that participants would locate targets more accurately in the top positions ($M = 0.93$, $SD =$

0.09) than in the bottom positions ($M = 0.78$, $SD = 0.19$). Planned comparison determined that, similar to the previous model, all three conditions (top, middle, and bottom) were significantly different from each other, all $t(126) \geq 4.92$, all $p_{bonf} \leq .001$, all $d \geq 0.53$.

The significant interaction effect of post type and target position was explored (see Figure 13), Hypothesis 3 predicted that the ad blindness effect would be largest in the bottom position. Planned comparisons revealed that the only significant accuracy difference was between content posts in the bottom position ($M = 0.87$, $SD = 0.11$) and ad posts in the bottom position ($M = 0.69$, $SD = 0.22$), $t(126) = 5.59$, $p_{bonf} < .001$, $d = 0.92$.

Figure 13

Accuracy of Identifying Targets in Different Post Types in Different Positions by Sub-Groups



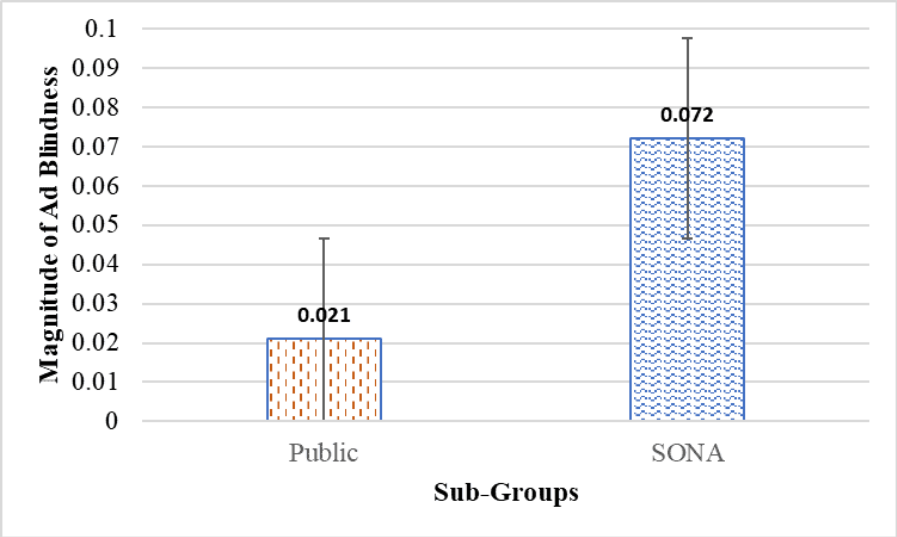
Note. The graph depicts accuracy by post type and target position for the two sub-groups (public data marked with blue and SONA data marked with orange). Ad post accuracy dropped significantly for both public and SONA groups in the bottom position; however, SONA accuracy decreased more compared to public ad accuracy.

T-Test for Magnitude of Ad Blindness by Sub-Groups. To further explore the sub-group differences, overall ad blindness magnitude (collapsed across position) for the public

sub-group (M = 0.021, SD = 0.098) and the SONA sub-group (M = 0.072, SD = 0.095) was investigated (see Figure 14). An independent samples t-test was conducted between the groups with different sample sizes (i.e., Hedges' g was used for correction of Cohens' d as an effect size), however, it did not return a significant result, $t(63) = -1.85$, $p = .07$, g = -.46. The finding suggested that, although the SONA sample had a higher overall ad blindness, there was only marginal evidence that the two groups were significantly more accurate than one another.

Figure 14

Magnitude of Ad Blindness by Sub-Groups

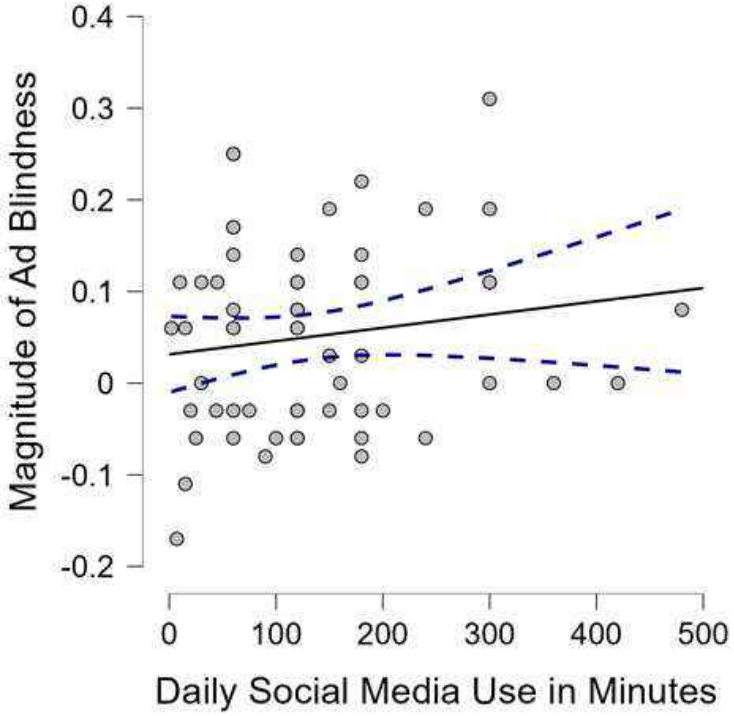


Note. A bar graph shows the magnitude of ad blindness by groups. Error bars represent standard error of the mean.

Correlation of Ad Blindness with Daily Social Media Use. In the planned analysis, Hypothesis 4 (that social media usage (FBI score) correlates positively with advertisement blindness magnitude) did not return significant results. We further investigated this research question by examining whether there is a correlation between daily social media use in minutes (continuous variable) and advertisement blindness magnitude (see Figure 15). After

Figure 15

Magnitude of Ad Blindness by Daily Social Media Use



Note. Scatter plot depicts the relationship between magnitude of ad blindness by daily social media use in minutes. The two variables were not related $r(63) = -0.095$.

performing a Pearson correlation, we found that the correlation between the variables was not statistically significant $r(63) = 0.095$, $p = .23$, $r^2 = 0.009$, 95% CI [-0.33;0.15]. We did not observe a significant linear relationship between ad blindness and time spent on social media.

Discussion

The purpose of this study was to examine users' interaction habits with social media ads on a smartphone to determine whether ad blindness is present in social media mobile applications and whether target position would influence ad blindness. More specifically, we were interested in whether users ignore ads (suffer from advertisement blindness) while they are performing a semantic search on a scrollable social media news feed on their phone. An additional goal of this research was to find evidence for a relationship between social media use and ad blindness.

Overall, the findings of this study support the notion that users show advertising blindness when viewing social media content on a smartphone application. Participants were worse at locating targets in ad posts than content posts, especially in the last third of the scrollable news feed. However, we did not find evidence that the amount of time users spent on social media correlated with ad blindness. Below, we discuss our hypotheses and findings in more detail.

Hypothesis 1 - Advertising Blindness

We hypothesized that participants would be more successful identifying targets in content posts than in advertisement posts. Consistent with our hypothesis, results indicated that identifying targets among content posts was more successful than finding them in ad posts. Thus, participants may have treated content posts as information sources and ignored advertisements, thus demonstrating advertisement blindness. As previous research suggested, ad blindness (i.e., banner, text ad, social media ad blindness) is present in websites on desktop computers (Barreto, 2013; Benway, 1998; Owens et al., 2011, 2014); however, the

phenomenon had not been assessed in an app environment until this point. The results revealed the first evidence of ad blindness on social media mobile applications.

Moreover, this study was also the first that designed and used a scrollable dynamic news feed that closely resembled a real-life Facebook news feed to measure ad blindness. Prior studies investigating ad blindness on social media websites used static images, users' own social media accounts or mock websites (Barreto, 2013; Bode et al., 2017). However, they were either lacking the natural feel of interaction, or the stimuli design limited internal validity. The stimuli design in this study authentically followed the user's news feed browsing experience. For example, we took into account that the news feed content-to-ad ratio needs to be as close to the real Facebook experience as possible to provide a natural flow and feel of content and ad position. The design not just conveniently replicated real life, but it was also important to have reliable ad and content placement, to counterbalance targets, and to measure target accuracy related to position.

Hypothesis 2 - Target Position

Second, we looked at target position as a differentiating factor for participants to locate targets more or less accurately. It was hypothesized that targets would be found more successfully in the top positions than in the bottom positions. As anticipated, our results indicated that participants' accuracy in identifying targets depended on the target's location. Furthermore, all three positions were significantly different from each other. This finding is in line with previous research that reported that reading patterns follow an 'F' shape. First, participants read across the top of the content, then a bit lower in the content. After that, they only scan the left side of the content (Nielsen, 2006; Pernice, 2017). Pernice (2017) found

that this reading technique was accurately replicated on mobile phones as well, meaning that this reading pattern could be a habit that consistently occurs when someone is taking in new information quickly. Thus, we predicted there would be a difference in comprehension between the top and bottom parts of the content, such that posts in the top position are scrutinized while posts in the bottom position are merely scanned.

Similarly, in our results, the top position yielded more accurate target discovery than the bottom position. Moreover, it is not only location, but Owens at al. (2014) found that physical characteristics also play a role in identifying advertisements. For example, in the current study stimuli screenshotted from Facebook, small and gray "Sponsored" labels indicated to participants that those posts are ads. One participant from the study shared that: "*I would intentionally not click the posts that said "Sponsored" since I know they are ads [...] I don't like clicking on ads often, it feels overly-targeted/irrelevant/'fake' so I don't tend to click them.*"

Hypothesis 3 - Interaction of Ad Blindness by Position

We also hypothesized that advertising blindness (the difference between content percent correct and ad percent correct) would be largest in the bottom position. In line with our hypothesis, performance on content versus ad posts was indeed the largest in the bottom compared to the middle and the top positions. This finding is in line with prior research that suggested that people become "satisfied" after they locate one or two targets. The phenomenon called "satisfaction of search" spans different disciplines, for example, in cognitive psychology, radiology, and border security. In our study, semantic target search always started at the top of the 18-post scrollable feed. While participants were searching for

the targets, they started to skip some ads due to ad blindness, and as they continued the search towards the bottom, it is possible that they terminated their search due to satisfaction of search (Adamo et al., 2021). Previous research only studied websites in terms of ad blindness. In websites, ads were historically located in the top (banner ads) and side locations (text ads) (Owens et al., 2011). Although app news feeds have a top region, there are no salient ads displayed there. Thus, app users had no chance to habituate to advertisements that usually appeared at the top like they did in the case of websites (Owens et al., 2011). Moreover, the Facebook app does not have a side area for ads (right or left side of the news feed) like in the website version. Ads are only displayed among content posts as native ads. Thus, users could not habituate to ads based on the app layout. Our analysis found that participants did not ignore ads significantly compared to content posts in the top and middle locations of the 18 image stimuli. In addition to the "satisfaction of search" phenomenon, as previously mentioned in Hypothesis 2, people's reading styles on phones and their understanding of ads' physical characteristics may have played a role in identifying ads more accurately in the top and middle positions than in the bottom positions in a scrollable news feed.

Hypothesis 4

In hypothesis 4, it was predicted that social media usage would correlate positively with advertisement blindness, however, the result did not show evidence that the two variables are related to each other. This finding is in contrast with our idea that the more time someone spends in a familiar environment, the more likely they are to habituate to the stimuli in that environment. Prior research from the human factors domain found that people become

habituated to warning signs with repeated exposure (Kim & Wogalter, 2009). However, in this study, we observed no significant correlation between social media use (exposure) and ad blindness. A replication with a more diverse sample in terms of user experience might possibly yield significant results.

Exploratory Analyses - Sub-group Differences

The demographic characteristics varied between the two sub-groups and initial analyses suggested that performance might be different. Consequently, exploratory analyses investigated whether there was any variation between the two samples. We concluded that the public group whose FBI score was higher and belonged to an older generation did not show the expected higher ad blindness scores compared to the younger and less engaged (i.e., Facebook) SONA group. Both groups showed the overall same pattern of results, but the public group was more accurate, overall. All in all, the finding indicated the opposite of what we expected. One reason could be that the public group tried harder even though their duration data (i.e., time on the task) does not show evidence for that. The only evidence available is written survey feedback and personal conversations with people after the study. One participant from the public group shared that they double-checked their answers before advancing further to the next trial. Another participant said that he avoids clicking on ads in real life and always skips them, however, because he was doing this experiment he took his time to find the answers needed to mark the posts correctly. Thus, some participants in the public group may have shown behaviors that deviated from their normal. In their accuracy data, it is visible that they were actively searching and that yielded near-ceiling performance. On the other hand, the goal of the participants in the SONA sample was to complete the task

quickly and gain credit. We do not have quantitative data to confirm that there were differences in the effort exerted between the groups, but written feedback and qualitative data suggest that the public sample with more engaged Facebook users may have tried to be more accurate at the task. Perhaps a more diverse sample of Facebook users, recruited through mTurk, Prolific, or other sources, might be a better population on which to test these hypotheses.

Finally, to test whether ad blindness correlates with social media use (Hypothesis 4) we performed another Pearson correlation, but for this analysis, we used the time participants spent using social media (time in general, not just Facebook use) and correlated it with ad blindness magnitude. Similarly to the previously performed correlation in the main analysis (FBI score by ad blindness), this test also did not show a significant relationship between the two variables. Perhaps a more diverse or larger sample of social media users also could show a different relationship between social media use and ad blindness.

Limitations

One limitation of the current study is that it would have benefited from more random sampling of Facebook users. Despite all our efforts, we did not find many expert Facebook users (observed FBI $M = 2.0$, where 5.0 indicates "expert" level). It is plausible that a more diverse sample data would show a significant positive relationship between ad blindness and social media usage.

Furthermore, we have to acknowledge that the Facebook app and the FBI Scale at this time (i.e., year of 2023) and climate perhaps was not the most successful choice to test the linear relationship between ad blindness and social media use in the sample we had. The

scale was created in 2007 when Facebook was highly popular, and the app stayed popular until around the mid 2010's. After that, the company (i.e., Meta) started stagnating, due to data handling issues and other apps gaining more popularity (i.e., Instagram). In general, people lost their trust in the app. Thus, the scale and the app itself did not work well to test the correlation between social media use and ad blindness in a population similar to the SONA group. As previously stated, younger generations are more likely to use Instagram, so investigating ad blindness using that app and the time they spend on that app would give more insights into how young people today interact with ads on social media apps. Facebook is a good choice to study older generations (e.g., those born before 1996) in the United States; however, an updated Facebook use scale or time spent on social media or the app itself could possibly yield significant results among a larger and more diverse sample.

Another limitation of the study was that participants perhaps were put into a user situation where they behaved unnaturally. Filling out the training trials and showing participants the "correct answer" at the beginning of the study might have made participants feel as if they were taking a test and therefore scrutinized the news feed for longer than they normally would. It could have signaled them that they need to find the right answers, rather than browsing and scrolling their news feed more naturally. This might be solved by adding time limits per trial (60 seconds) to create urgency and prompt participants to limit how much time they spend on each trial. Also, searching a Facebook news feed could have felt unnatural to users because there are only limited times someone would do that.

In this study, participants were tasked to do a semantic search task, and that could have made them pay closer attention to the ad posts than they usually would in real life. Some

participants reported that they usually avoid clicking and reading ad posts, but because of the task, they read and selected the ads as well. However, employing the semantic search task was already part of a stricter task development because previous research reported that semantic search yielded lower recognition scores than exact search (Portnoy, 2012). A keyword search only requires searching for an exact item. In contrast, semantic search requires understanding and reviewing the stimuli more carefully.

Finally, every news feed stimulus had a set pattern (i.e., every third post was an ad) and that might be concerning because participants could have noticed the pattern and ignored every third post, elevating their ad blindness. In the demographics questionnaire section of the study, we asked participants whether they noticed a pattern in how often ads were appearing in the study news feeds. 63% of the participants (N=60) said they did not notice a pattern and 35% said they did notice, one gave a nonrelevant answer. After analyzing the answers, it appeared that some participants were referring to their real-world Facebook news feed activity and not the study trials (see Appendix F). For example, "*Yes, I would talk about the topic of getting a new car or maybe sports, and then I would see the ad pop up, which is very strange."* Thus, after removing the questionable answers only 13% of the participants reported noticing an ad-related pattern in the trials. Therefore, we can conclude that more than the majority of participants did not notice a pattern to which posts are content and which are ads.

Future Directions

Future research should first replicate the findings with a more diverse (i.e., age, social media use) sample. Recruitment could be state or nationwide to achieve robust findings.

Moreover, further studies should investigate and compare ad blindness effects among different social media apps (e.g., Instagram, Linkedin). It would be interesting to see how different social media platforms compare in ad blindness magnitude or investigate their ways of displaying ad-related labels. Research findings could serve as a missing data point for lawmakers to tighten advertisement displaying regulations and make ads more recognizable and distinguished from content on social media platforms. Furthermore, ad blindness differences could be explored between commercial, civil, and non-profit advertisements and/or content. On Facebook, there were no different ad disclosure labels that indicated or differentiated the three categories. Perhaps their ads are similarly ignored as commercial ads. That might be due to ad blindness developed for all the ad types by users due to businesses' intrusive and aggressive advertisement tactics that nonprofits can not compete with. However, it would be interesting to see if people perceive the ad types differently. Or would users wish to recognize the difference between these ad forms?

Conclusion

The purpose of this research was to understand users' impressions of social media advertisements consumed through mobile applications. This research provided some of the first evidence for ad blindness on smartphone apps. We found that participants were more successful in identifying targets in content posts than in ad posts. Thus, participants automatically ignored information while they performed a semantic search task, which was a sign of ad blindness. Moreover, we expected to find a relationship between ad blindness and social media use; however, the data did not yield a significant result. Additionally, target position was discovered to be an important factor when it comes to in-app advertising. We found that the ads are more effective at the beginning of the feed and gradually become less effective later in the feed. This finding suggests a real-world implication that could be important for companies owning these social media platforms and for marketers who are trying to build brand awareness.

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Appendix A-Sample Demographic Questionnaire

1. Which gender identity do you most identify with?

1. Male
2. Female
3. Transgender
4. Non-binary/non-conforming
5. Other
6. Prefer not to say

2. What is your current age in years?

3. Which ethnic/racial group do you most identify with?

1. White/Caucasian
2. Hispanic/Latino
3. Black/African American
4. Middle Eastern
2. Asian
3. Pacific Islander
4. Native American
5. Multi-ethnic or Mixed race
6. Other
7. Prefer not to say

4. What is the highest level of education you have completed?

1. Less than high school degree
2. High school graduate (high school diploma or equivalent including GED)
3. Some college, but no degree
4. Associates or technical degree (2-year)
5. Bachelor's degree (4-year)
6. Graduate or professional degree (MA, MS, MBA, PhD, JD, MD etc.)
7. Prefer not to say

5. Hours of social media usage per day in minutes, e.g., 10 min, 1 hour = 60 min, 2 hours = 120 min, 3 hours = 180 min, etc.

minutes

6. I have a Facebook account (account: either active or deactivated)

- yes
- no

7. I use my Facebook profile on…

- mobile phone app
- tablet (app)
- browser (phone or tablet)

8. Do you use an ad blocker on your phone?

- yes
- no

9. What is the make and brand of the phone that you completed this survey with? What is the screen size? (e.g., iPhone 11 Pro)

Appendix B-Facebook Intensity Scale (FBI)

Please indicate the extent to which you agree or disagree with the following statements.

1 = Strongly disagree; 2= Somewhat disagree; 3 = Neither agree nor disagree;
4 = Somewhat agree; 5 = Strongly agree.

1. Facebook is part of my everyday activity

Strongly					Strongly
1	2	3	4	5	
Disagree					Agree

2. I am proud to tell people I'm on Facebook

Strongly					Strongly
1	2	3	4	5	
Disagree					Agree

3. Facebook has become part of my daily routine

Strongly					Strongly
1	2	3	4	5	
Disagree					Agree

4. I feel out of touch when I haven't logged onto Facebook for a while

Strongly					Strongly
1	2	3	4	5	
Disagree					Agree

5. I feel I am part of the Facebook community

Strongly					Strongly
1	2	3	4	5	
Disagree					Agree

6. I would be sorry if Facebook shut down

Strongly					Strongly
1	2	3	4	5	
Disagree					Agree

7. Approximately how many TOTAL Facebook friends do you have?

- 100 or less
- 101 - 200
- 201 - 300
- 301 - 400
- 401 - 500
- 501 - 600
- 601 - 700
- more than 700

8. In the past week, on average, approximately how much time PER DAY have you spent actively using Facebook in minutes? For example, 10 min, 1 hour = 60 min, 2 hours = 120 min, 3 hours = 180 min, etc.)

minutes

Appendix C-Recruitment Materials

SONA Instructions/Descriptions

Complete a 30-minute social media search task and two short questionnaires online **on your phone** for 0.5 SONA credits. We are collecting data on social media news feed interaction habits. You can only participate in this study if you have a Facebook account (active or deactivated). In total, the survey will take approximately 25-30 minutes to complete. To receive full credit (0.5 SONA credits) you must complete all questionnaires and answer most every question honestly. You will only receive partial credit if your responses demonstrate a genuine lack of attention and/or effort.

Word-of-mouth Recruitment Instructions/Descriptions

Complete a social media search task and two short questionnaires online **on your phone**. We are collecting data on social media news feed interaction habits. In total, the survey will take approximately 25-30 minutes to complete. You can only participate in this study if you have a Facebook account (active or deactivated).

Appendix D-Consent Documents (SONA Participants)

REQUEST FOR YOUR PARTICIPATION IN RESEARCH

TITLE OF THE STUDY
Social Media News Feed Interaction Habits

NAME OF THE RESEARCHER
Dr. Evan Palmer

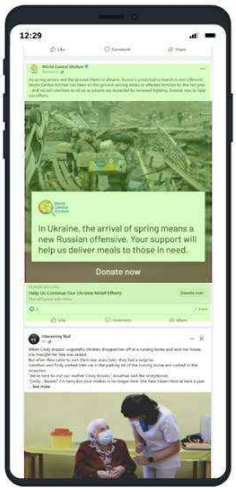
Nora Szladovics, Research Assistant, candidate for MA in Psychology. You have the opportunity to complete this research study for course credit as designated by your instructor. Please take your time in deciding if you would like to participate. You may complete an alternative assignment for equal course credit by reading and summarizing a scholarly journal article.

You must be at least 18 years old and have a Facebook account (either active or deactivated) to participate in this study.

PURPOSE
The purpose of this study is to understand users' interaction habits with simulated in-app social media posts and to help us better understand their perception of the news feed.

PROCEDURES
Should you agree to participate, you will be asked to scroll through 23 news feeds (18 images each) on your phone and select every relevant post that answers the prompt at the top of each feed. All social media posts in the tasks can be highlighted with a tap (you could select multiple posts). When a post is selected, it will turn green. You can change and unselect your response by tapping on that post again then the green highlight will disappear. You will not be able to go back and edit your answers after you advance to the next page. You will also be given two short questionnaires to complete. All materials will be presented online. The expected average time to complete the study is between 20 and 30 minutes (although some may take less or more time). Please complete the tasks in one sitting.

Example of a selected post (green rectangle):



POTENTIAL RISKS
There are no foreseeable risks involved with participation in this study.

POTENTIAL BENEFITS
By participating in this study, you may help contribute to generalizable knowledge regarding individual differences.

COMPENSATION
You can earn up to 0.5 SONA credits toward your course requirement in Psychology 1.

To receive full credit (30 minutes) you must complete all questionnaires and answer most every question honestly. You will only receive partial credit if your responses demonstrate a genuine lack of attention and/or effort.

CONFIDENTIALITY
All questionnaires have no direct identifying questions on them. Awarded course credit will not be associated with any identifiable information.

PARTICIPANT RIGHTS
Your participation in this study is completely voluntary. You can refuse to participate in the entire study or any part of the study without any negative effect on your relations with San Jose State University. You also have the right to skip any question you do not wish to answer. This consent form is not a contract. It is a written explanation of what will happen during the study if you decide to participate. You will not waive any rights if you choose not to participate, and you will only receive partial credit for partial participation.

QUESTIONS OR PROBLEMS
You are encouraged to ask questions at any time during this study.

- For further information about the study, please contact Dr. Evan Palmer at evan.palmer@sjsu.edu or at 408-924-5547.
- Complaints about the research may be presented to Dr. Clifton Oyamot, Chair of the Psychology Department at 408-924-5600.
- For questions about participants' rights or if you feel you have been harmed in any way by your participation in this study, please contact **Dr. Richard Mocarski**, Associate **Vice President for Research**, San Jose State University, at 408-924-2479, irb@sjsu.edu

CONSENT
Clicking "SUBMIT" indicates that you voluntarily agree to be a part of the study, that the details of the study have been explained to you, that you have been given time to read this document, and that your questions have been answered.

If you have read and agree to the conditions in this consent page, please click "SUBMIT" to continue to the online questionnaires.

SUBMIT

Appendix E-Consent Documents (Word-of-mouth Recruitment)

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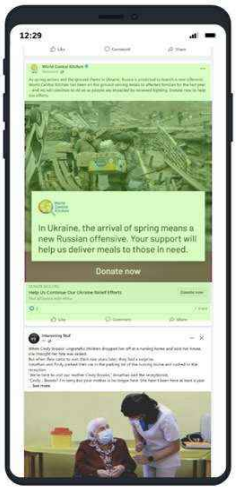
Example of a selected post (green rectangle):



POTENTIAL RISKS
There are no foreseeable risks involved with participation in this study.

POTENTIAL BENEFITS
By participating in this study, you may help contribute to generalizable knowledge regarding individual differences.

COMPENSATION
There is no compensation for participating in this study.

CONFIDENTIALITY
All questionnaires have no direct identifying questions on them.

PARTICIPANT RIGHTS
Your participation in this study is completely voluntary. You can refuse to participate in the entire study or any part of the study without any negative effect. You also have the right to skip any question you do not wish to answer. This consent form is not a contract. It is a written explanation of what will happen during the study if you decide to participate. You will not waive any rights if you choose not to participate.

QUESTIONS OR PROBLEMS
You are encouraged to ask questions at any time during this study.

- For further information about the study, please contact Dr. Evan Palmer at evan.palmer@sjsu.edu or at 408-924-5547.
- Complaints about the research may be presented to Dr. Clifton Oyamot, Chair of the Psychology Department at 408-924-5600.
- For questions about participants' rights or if you feel you have been harmed in any way by your participation in this study, please contact **Dr. Richard Mocarski**, Associate **Vice President for Research**, San Jose State University, at 408-924-2479 or irb@sjsu.edu

CONSENT
Clicking "SUBMIT" indicates that you voluntarily agree to be a part of the study, that the details of the study have been explained to you, that you have been given time to read this document, and that your questions have been answered.

If you have read and agree to the conditions in this consent page, please click "SUBMIT" to continue to the online questionnaires.

SUBMIT

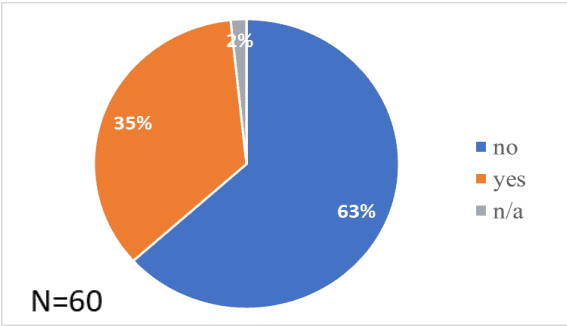
Appendix F-Qualitative Data Regarding Ad and Content Post Pattern

Did you notice a pattern in how often ads were appearing in the study news feeds?

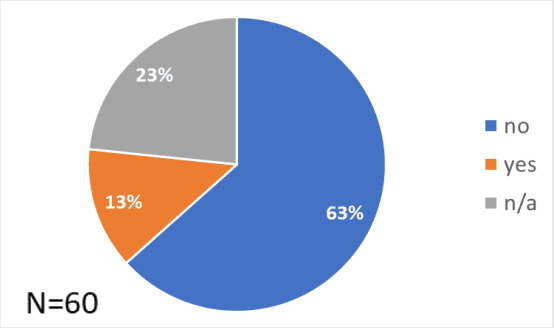
Participants' answers:

- *I did not notice a pattern*
- *Yes, sometimes ads on Facebook would tailor towards what you have been liking and seeing on Facebook. It would attempt to make a personal experience for you down to the ads*
- *Yes, there was an increasing amount of ads as the trial went on*

Qualitative data displayed regarding ad and content post pattern



Note. Initially, 40% said yes for noticing a pattern.



Note. After analysing the answers closely, it appears only 13% noticed a pattern.

The majority of participants did not notice a pattern of how often ads were appearing in the trials. Even if participants said yes, they often referred to their real world Facebook news feed and how it is tailored to them. Or they didn't answer the question.

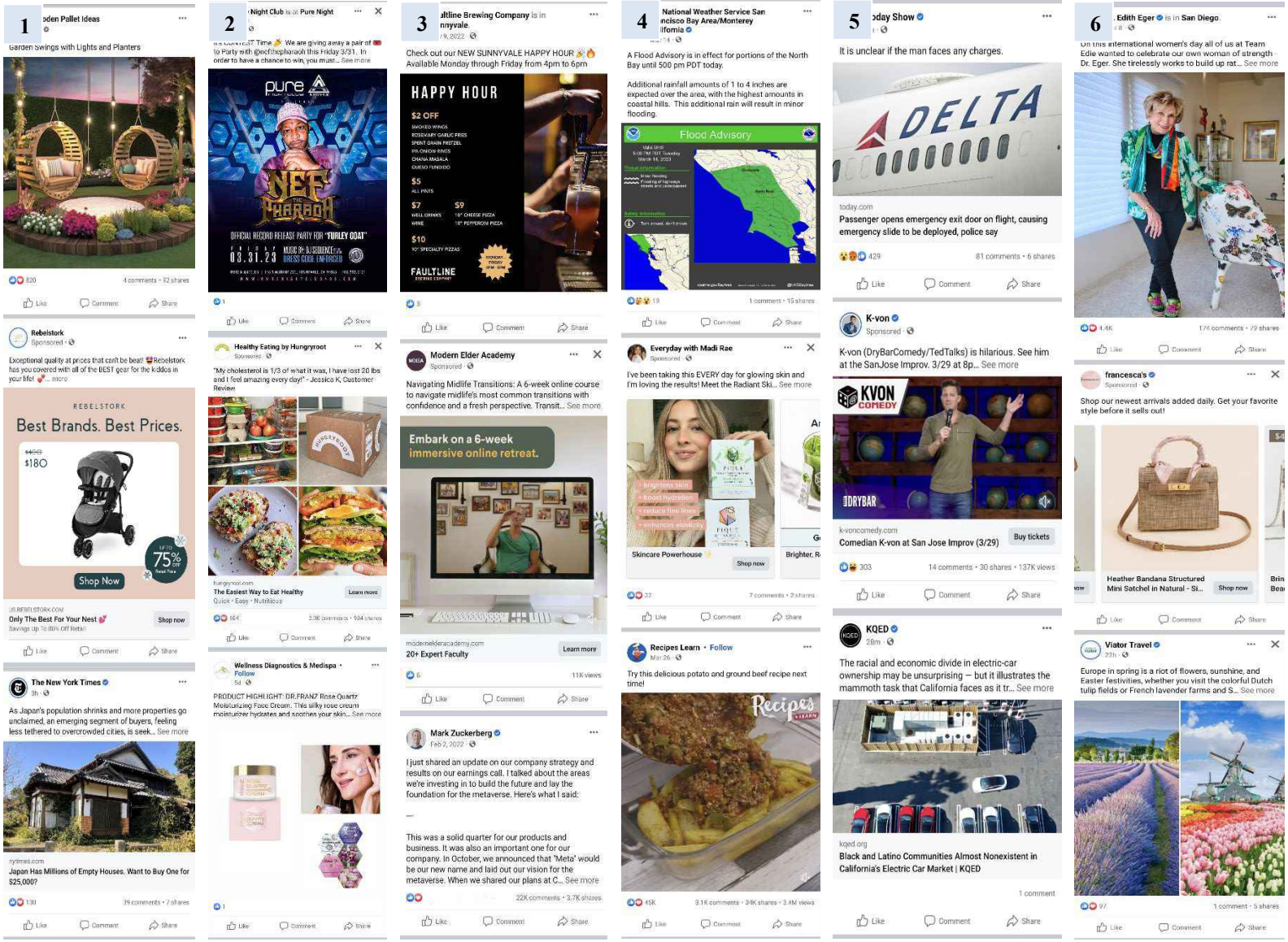
Appendix G-Participants' Answers Regarding Ad and Content Post Pattern

ID	Did you notice a pattern in how often ads were appearing in the study news feeds (e.g., yes, no)? If so, please elaborate.
0	no
1	No, I didn't see a pattern. But I did notice them. There were lots of them.
2	No
3	About every third post.
4	No
5	No
6	No
7	Yes. They mirror searches. Like I look for e bike, ads are for ebikes
8	No
9	not really. I did notice repeats for certain things, but I went through them so fast, that was the only thing that registered.
10	No
11	No, I did not see a pattern.
12	
13	No. In my mind, all of those are ads, especially the clickbait news articles.
14	no, not really
15	Yes. Mostly influenced by my online search behavior or recently opened pages.
17	No
18	Yes, after every 2 or 3 posts
19	Yes, for one of the first questions regarding "pick where you want to learn a new skill from" I would intentionally not click the posts that said "Sponsored" since I know they are ads and not in the natural flow of my feed. I don't like clicking on ads often, it feels overly-targeted/irrelevant/'fake' so I don't tend to click them.
21	Yes, not only from search history but even from verbal conversations. I also have my mic turned 0 to avoid that as well.
22	I did not notice any particular pattern.
23	all the time
24	No
25	I was noticing posts related to the questionnaire in the previous question.
26	yes, there was an increasing amount of ads as the trials went on
27	when I wasn't focusing on a specific ad / topic they'd appear more often in the next phase
28	No
29	Yes, there was a variety of posts and ads that were not related to the prompt.
30	No
31	Yes, sometimes ads on Facebook would tailor towards what you have been

	liking and seeing on Facebook. It would attempt to make a personal experience for you down to the ads.
33	no, i wasn't paying much mind to the things not relevant to the question asked unless it was an ad i would've clicked on lmao
34	No
35	Yes, there were recurring topics that kept appearing. For example, I noticed in every situation there would always be recurring news about celebrities, traveling, food, education, news, and shopping ads.
36	I was unaware of a pattern
37	no
38	no
39	no
40	I did not notice a pattern.
41	no
42	Yes but I didn't think much of it.
43	Yes, I noticed a pattern in how often the ads were appearing in the study news feeds. I noticed how one different question there were more specific types of ads.
44	Not really
45	yes, quite frequently
46	No
47	I think that I noticed that the ads were related to the previous topics.
48	no
49	no
50	no
51	No
53	Yes; the ads seemed to coincide with the user's interests / what they sought out to look for.
54	no
55	Yes, it is whatever I talk about in my everyday life which is weird.
56	No, I did not.
57	Yes, I would talk about the topic of getting a new car or maybe sports and then I would see the ad pop up which is very strange.
58	no
59	No
60	No, I didn't really notice
61	No
62	no
63	no
64	Yes I realized it was pretty frequent, much more than I expected.

Appendix H-Example Full Trials (Stimuli 11)

Stimuli 11 - To improve readability, the 18-image-long news feed has been divided into six 3-piece images.



Appendix I-Screenshot of the Scrollable News Feed in Qualtrics (Stimuli 5)

Image is a screenshot of stimuli 5 in Qualtrics (www.qualtrics.com). The image also shows the hot spot question type and its property selections.

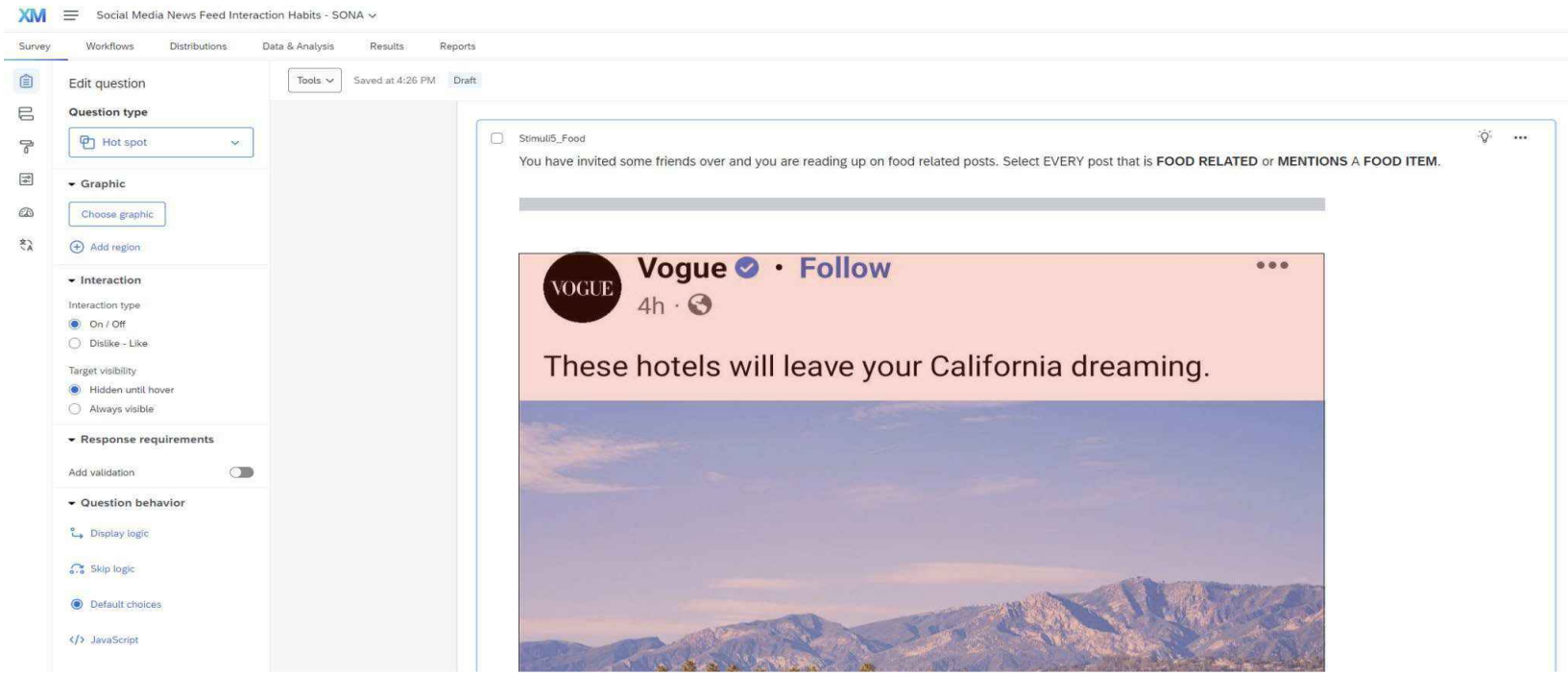
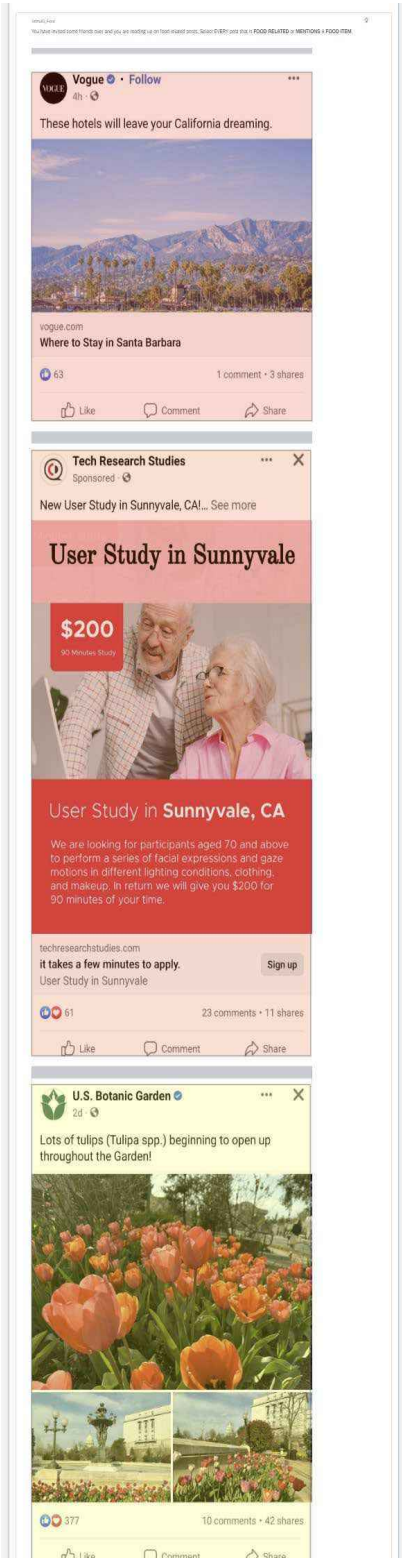


Image is from stimuli 5 displayed in Qualtrics.



Appendix J-Counterbalancing Sheets

			Trials																		
		Post type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
	1	Content		x												x			x		3
	2	Ad	x									x						x			3
TOP	3	Content								x				x						x	3
	4	Content											x		x				x		3
	5	Ad			x				x								x				3
	6	Content				x					x					x					3
	7	Content						x					x				x				3
	8	Ad		x										x					x		3
MID	9	Content										x			x					x	3
	10	Content	x							x						x					3
	11	Ad					x				x				x						3
	12	Content							x								x	x			3
	13	Content			x										x					x	3
	14	Ad				x							x			x					3
BOT	15	Content										x						x	x		3
	16	Content									x			x			x				3
	17	Ad						x		x										x	3
	18	Content					x		x									x			3
			2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	54
			2 Targets						3 Targets						4 Targets						

						TOP							MID						BOT					
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Trial	# of Targets (randomized)	Randomized trial scenerio	Topic (rendomized)	Prompt		C	A	C	C	A	C	C	A	C	C	A	C	C	A	C	C	A	C
1	t3		education	During the pan			x								x								x
2	t2		backyard	Your parents ar									x								x		
3	t4		celebs	Reading about					x			x						x				x	
4	2	6	event	Your dad loves			x								x								
5	3	4	sport	Your buddies at						x							x						x
6	3	2	job	Graduation is a					x						x							x	
7	4	1	donation	You just moved				x						x		x		x					
8	3	3	food	You have invite						x						x						x	
9	2	5	celebs	You love to rea	x								x										
10	attention check1		-		x	x	x	x	x		x				x								
11	4	11	health	One of your clo	x					x					x				x				
12	3	7	travel	You have been		x								x						x			
13	2	10	product	You are looking					x									x					
14	3	9	event	You are plannir				x			x								x				
15	4	12	travel	Your college bu					x		x						x				x		
16	4	8	museum	Your friend invi		x											x			x			x
17	2	16	baby, kids	Your older siste						x									x				
18	4	13	travel	You and a frien	x			x					x							x			
19	attention check2		-																		x	x	x
20	2	18	service	Watching TV is												x							x
21	2	15	education	One of your Ne							x											x	
22	3	17	travel	You have decid			x					x									x		
23	4	14	product	You are interes			x						x				x					x	