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Headlines, Pictures, Likes: Attention to Social Media Newsfeed Post Elements on Smartphones and in Public

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Abstract
Scrolling through a social media newsfeed has become almost ubiquitous. Yet, it remains unknown what specific post elements people pay attention to and whether this varies depending on how they access social media newsfeeds. In an eye-tracking experiment among university students ($N=201$), we compare user attention to specific post elements like source, title, or picture, in a dynamic Facebook newsfeed by device (desktop vs. mobile) and smartphone usage environment (private vs. public). Significant attentional differences occur at the level of the newsfeed post elements. Users pay less attention to visual information on the mobile newsfeed and more attention to textual post elements in a public setting.

Keywords
post elements, social media, newsfeed, eye tracking, attention

Introduction

Scrolling through newsfeeds has become a common social media usage behavior (Anspach et al., 2019). In a Pew Research Center report from 2021, 69% of US adults reported having used Facebook, 70% of those on a daily basis (Auxier & Anderson, 2021). People scroll through social media on different devices and in various contexts. Access to news on Facebook or Instagram, for example, is progressively shifting from desktops to mobile devices (Newman et al., 2022; Walker, 2019). Furthermore, social media newsfeed consumption, particularly on mobile devices, happens independently of specific times and locations (Dimmick et al., 2011; Wolf & Schnauber, 2015). People consume newsfeeds in busy environments, like on a subway, where social co-presence, as well as visual and auditory distractions, can alter attentional patterns of audiences in contrast to accessing social media in settings with less distraction, for example, a controlled lab environment that is similar to quiet, private settings (Ohme, Searles, & de Vreese, 2022).

Furthermore, research shows that people only click on a fraction of the posts they see and favor short cognitive practices like snacking or skimming (Costera Meijer & Groot Kormelink, 2015; Ohme & Mothes, 2023). When users remain on the newsfeed level ("first-level selective exposure," see Ohme & Mothes, 2020, p. 1223), it becomes necessary to measure exposure to digital content beyond click decisions (Vraga et al., 2019). Thus, how people divide their visual attention is a precondition to understanding media users' processing and subsequent media effects (Barry, 1987). For example, multitasking research has established how attention divided between screens affects information processing of the media content on those screens (Segijn et al., 2017). In addition, while research has shown that social media endorsements (e.g., likes and reactions) are thought to drive the selection of news posts (Dvir-Gvirsman, 2019), only a few studies address whether and to what degree users consciously attend to these small elements of a newsfeed post. Moreover, how this differs depending on devices and usage environments that depict current and realistic scenarios of scrolling through a newsfeed is, to our knowledge, not yet examined.

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To better understand attention to social media newsfeeds, this study investigates the visual attention paid to the specific, and typical elements of a social media newsfeed post (i.e., source, headline, picture, title, likes, and reactions) and the attentional differences between devices and usage environments. We conducted an eye-tracking experiment with a between-subjects factorial design consisting of three conditions and a dynamic Facebook newsfeed (*N* = 201). We compared the visual attention paid to the entire Facebook newsfeed and the various post elements (1) on a desktop and mobile newsfeed in a private, controlled lab setting (device comparison) and (2) on a mobile newsfeed in a public and private setting (environment comparison). By employing the same dynamic (i.e., scrollable) newsfeed throughout the conditions and eye tracking directly on a smartphone, this is one of the first studies to provide insights on the distribution of attention across devices and usage environments on a granular level of social media post elements.

The study has three important theoretical and practical contributions. First, it applies theoretical approaches to mobile-specific usage behavior (e.g., Eye-Mind Hypothesis, Just & Carpenter, 1980; attributes of mobile media use, Ohme, 2020) to post elements. This helps us to understand the role of smartphone-driven information exposure on a granular content level. Second, the study presents an important extension of our understanding of how mobile media usage environments impact the exposure to media content by applying Multiple Resource Theory (Wickens, 1984). Third, the study has practical implications for mobile media content creators, presenting substantial evidence on where users' attention to social media post elements is allocated. This can help create posts that align with users' attentional patterns and potentially increase exposure experiences through content optimization and subsequent learning for smartphone users.

Theoretical Background

Attention to Elements of Social Media Newsfeed Posts

Social media newsfeed posts can be understood as snacks of information for users that present short summaries for those scrolling through their newsfeed (Costera Meijer & Groot Kormelink, 2015). They can serve as "appetizers" for interested audiences, who will likely click on the link leading them to the complete content, and present short summaries for those scrolling through their newsfeed more habitually and only occasionally stopping at a specific post. Hence, the attention newsfeed posts attract can be an important gateway to more in-depth information exposure. The format of social media newsfeed posts can be divided into predominantly textual elements such as the *source, header*, and *title*, a *picture*, and social cues such as *likes* and *reactions* (see Figure 1).

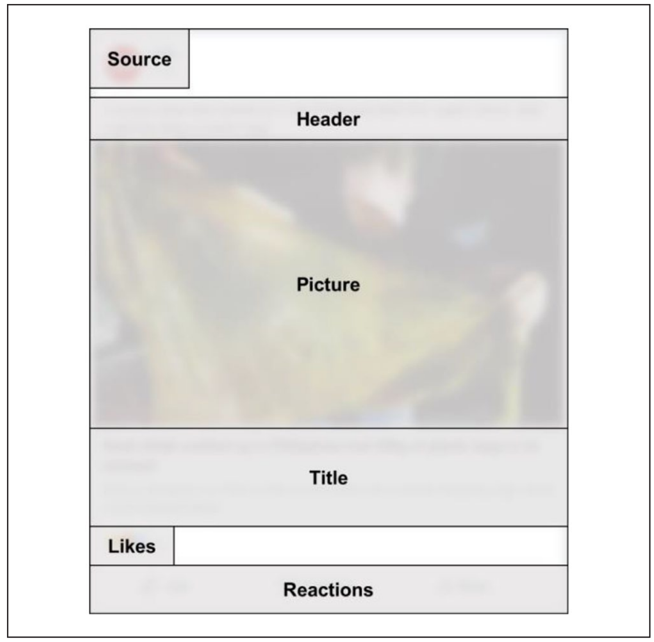

Figure 1. A typical Facebook newsfeed post and its elements as shown on a desktop PC in the year of the study (2019).

The Eye-Mind Hypothesis (Just & Carpenter, 1980) can help us understand the importance of the amount of attention users give to specific newsfeed post elements on social media. The hypothesis assumes that what people look at largely determines how they process a message. In the context of scientific texts, Just and Carpenter (1980) discuss the relationship between reading and information processing by describing how a reader fixates on a word until the information conveyed by it has been fully processed and only then continues to the next word (Duchowski, 2007). Thus, fixation-based metrics offer a simple way to understand cognitive processes and have, accordingly, become "the most common approach" (King et al., 2019, p. 152) to studying attention given to any area of interest (AOI) based on the person's eye remaining briefly stationary on said AOI. Research on this measurement of attention in a social media newsfeed context shows that users mostly fixate longer on textual post elements relative to images and social cues (e.g., Dvir-Gvirsman, 2019; Sülflow et al., 2019). However, newsfeed posts including richer content, such as *pictures* or *external links*, have also been found to enhance fixation to posts on social media compared to text only (Vraga et al., 2016).

Post elements are frequently presumed to fulfill essential functions in information consumption and media effects on social media. For example, previous research on topics such as "fake news" suggests that the *source* helps readers quickly and continuously assess the credibility of messages in a scrollable social media newsfeed (Chou et al., 2020; Flintham et al., 2018; Sülflow et al., 2019). Post elements containing social information, such as *likes*, *reactions*, and *comments*, furthermore, are accredited to playing an essential role in the user's perception and selection (Haim et al., 2018; Mothes &

Ohme, 2019; Porten-Cheé et al., 2018; Segesten et al., 2022). Other studies have, in general, shown that the visual attention given to newsfeed posts as well as specific post elements may indicate subsequent cognitive and behavioral processes such as engagement (Stroud et al., 2022), persuasion (Felix & Borges, 2014; Maslowska et al., 2021), attitudes (Sülflow et al., 2019), and learning (Kruikemeier et al., 2018; Ohme, Maslowska, & Mothes, 2022). These assumed effects of social media newsfeed posts and post elements are, however, not without contradiction. For example, while social cues have been shown to be not effective in influencing selection of posts in newsfeed experiments (e.g., Ohme & Mothes, 2020) other studies find that number of likes can drive selection and attention to newsfeed posts (Dvir-Gvirsman, 2019; Winter et al., 2016). In a meta-study, Haim et al. (2018) conclude that popularity cues have mixed effects on selection and other behavioral measures. One reason for the inconsistency of influence could be that the visual attention to the cues was not strong enough to elicit selection effects—a result that needs to be further tested with attention measures like eye tracking.

However, while these studies exemplify the relevance and effects of mostly specific post elements in a social media newsfeed, little is known about whether and to what degree readers actually pay attention to them when casually scrolling through the newsfeed in realistic, everyday media usage situations—in contrast to controlled and mostly private lab settings. Rather, most of the studies build on comparative designs that differ in the manipulation of the newsfeed post elements themselves, e.g., high and low social endorsements (Dvir-Gvirsman, 2019) or different valences (Keib et al., 2018; Kohout et al., 2023), within a single newsfeed. Moreover, the predominantly lab-based experiments with participants scrolling through newsfeeds mostly on a desktop PC create a research gap as well as a gap in ecological validity not only for smartphone devices but also their characteristic usage situations, such as being on the go in a public environment (Dvir-Gvirsman, 2019; Vraga et al., 2016). Hence, further research is needed on whether existent and contradicting findings hold across (1) devices (i.e., desktop or smartphone) and (2) usage environments (i.e., private or public).

Newsfeed Attention by Device

Social media user experiences differ between devices, such as between desktop and smartphone (Dunaway et al., 2018; Dunaway & Soroka, 2021). This could be explained by differences in affordances between devices. From a practical and hardware level, the screen size of a desktop is much larger than that of a smartphone. Scrolling and information selection are done with a mouse and a keyboard, while for handheld devices, this is mostly done with a fingertip, specifically, the tip of a thumb. In addition, the viewing angle of a smartphone is different (and more flexible) than on a desktop computer. This means that perception (i.e., different screen sizes) and proximity, referring to the heightened interconnectedness with social media content on mobile devices, as two attributes defining mobile device exposure (Ohme, 2020), need to be considered when trying to understand attentional differences between devices.

Differences in perception and proximity between devices lead to users orienting themselves differently in the digital space of a newsfeed, which is likely to alter attention. Smartphone exposure can mean, for example, higher cognitive effort for users when extracting information (Chae & Kim, 2004; Dunaway & Soroka, 2021). This can result in less time spent with information, diminished ease of reading (Al Ghamdi et al., 2016; Dunaway & Soroka, 2021), and ultimately, fewer cognitive resources available for information processing (Napoli & Obar, 2014) and subsequent learning (Sanchez & Branaghan, 2011). Social media newsfeed studies with device comparisons show that users, in general, have a shorter news exposure (Molyneux, 2018) and click less on news posts (Collier et al., 2021) on smartphones than on desktops. Similarly, users allocate equal or less attention to newsfeed posts on a smartphone relative to a desktop PC (Maslowska et al., 2021; Ohme, Searles, & de Vreese, 2022). Research on attention allocation to social media newsfeed posts on the granular level of post elements between devices is sparse. This restricts our understanding of what particular post elements users encode and process on various devices. A noteworthy exception are Keib et al. (2022), who looked specifically at the *pictures* of newsfeed posts and found that users viewed the images of newsfeed posts shorter on a mobile than on desktop. To further our understanding of attention allocation to different post elements between devices, we ask:

RQ1: Are there differences in the attention paid to post elements between devices?

Newsfeed Attention by (Mobile) Usage Environment

Smartphones are most often used on the go, in many environments such as in the subway or cafeteria, frequently being surrounded by other people (Newman et al., 2017). However, whether and how this impacts attention allocation is largely unknown, as previous studies on mobile access to social media and attention have been typically conducted in more controlled/private (lab) settings. The Multiple Resource Theory (Wickens, 1984) suggests attention to be lower if multiple stimuli need to be processed simultaneously. Since every task people carry out demands specific cognitive resources, these resources are limited in their availability among humans (Fisher et al., 2019; Lang, 2000). This means the more tasks must be performed simultaneously, the more the available cognitive resources per task decrease (Kaplan & Berman, 2010; Wickens, 2008). For example, studies into media multitasking found that using another device while watching television goes at the expense of attention allocated to and processing of the content of both media (Beuckels et al., 2021; Ran et al., 2016; Segijn et al., 2017).

Usage environments can be distinguished along three situational factors that differentiate public from private settings (Ohme, Searles, & de Vreese, 2022): (a) noise distractions, (b) visual distractions, and (c) social presence. We define settings where these three factors of distractions are present as public environments, while in a private environment, these factors are mostly absent. We understand public vs. private as two typical usage situations on this continuum, as many other mixed usage situations exist that cannot all be taken into account in this experimental study. The situational factors can lead to lower attention to information consumed in public vs. private environments. However, research also suggests that humans are in a constant surveillance mode the more other humans surround them. This level of vigilance or alertness due to constant surveillance of the environment leaves fewer resources available for the primary task they perform (e.g., Mobbs et al., 2015). Therefore, it is conceivable that social presence, visual and auditory distractors, which are likely present in a public setting, can alter attentional patterns of audiences.

Specifically for media exposure, in a social media-similar context, Jang (2014), who investigated the impact of cognitive load on selective exposure for a desktop news website, found that participants in the high cognitive load condition (i.e., performing an additional task while browsing a news website and clicking on interesting posts) did not engage in selective exposure. This suggests that in a situation that puts pressure in the sense of cognitive overload on the processing capacity (Lang, 2000), insufficient resources might be left to discriminate between media messages based on people's preferences. Thus, in social media usage situations, cognitively more taxing environments, such as a public setting with more audible and visual distractions and social co-presence (e.g., a cafeteria and the subway), may cause attentional attributions to different newsfeed post elements to become more difficult for users, and result in shorter visual attention spans. However, Ohme, Searles, & de Vreese (2022) find the opposite, with participants showing higher visual attention to whole social media news posts in a public rather than a private exposure situation. They explain their results by arguing that a more taxing environment may increase the cognitive effort in information extraction, leading to more instead of less visual attention (i.e., a longer duration of information processing). Given the lack of research focusing on post element-differences and contradictory results from prior research, we pose the following research question:

RQ2: Are there differences in the attention paid to post elements between usage environments?

Method

Design and Participants

The study investigates differences in user attention to elements of social media posts between devices (desktop and smartphone) and usage environments (private and public). We conducted an eye-tracking experiment with a between-subjects factorial design containing three conditions among 201 Dutch university students. Importantly, we exposed participants in all conditions to the same content and used the same eye tracker to measure participants' eye movements while scrolling through a newsfeed. To increase external validity, we designed a newsfeed that closely resembled Facebook's newsfeed design at the time of the study and used real, non-manipulated posts, which were collected from Facebook. Furthermore, realism was increased by allowing participants to scroll through the newsfeed, as this is one of the most frequent usage behaviors on social media platforms (Anspach et al., 2019).

To ensure a high internal validity, the studies were conducted in a controlled, experimental setting, where participants were assigned to three different conditions. For the device condition (RQ1), participants were assigned to scroll through the newsfeed stimulus either on a desktop PC or a smartphone in a quiet and controlled lab facility with a low number of distractions. Given that people are more likely to scroll through social media on a smartphone and, specifically, in a public environment characterized by a large number of audible and visual distractions and possibly social co-presence, participants were also assigned to scroll through the mobile newsfeed in a public setting—the university's bustling cafeteria (RQ2). Thus, we are looking at two typical situations of social media usage with varying degrees of the factors defining private vs. public usage environments (Ohme, Searles, & de Vreese, 2022), that is, a quiet and private environment with no strong audible or visual distraction (the lab) and a noisy environment with significant distractions and high social co-presence (the cafeteria).

We only included participants for which 90% or more of eye-tracking data was available, leading to the exclusion of seven participants.[1] The final sample consisted of participants recruited via an online participant pool of the University of Amsterdam (N=201, 72.64% female, 1 diverse, M_{age}=21.68, SD_{age}=2.99), and data was collected between May and October 2019. The distribution of the participants between the three different conditions was as follows: (1) desktop PC in a lab setting (N=63), (2) mobile in a lab setting (N=59), and (3) mobile in a public setting (N=79). The study received approval from the university's Ethical Review Board (IRB Number 2019-PC-10454) before data collection.

Procedure

Once participants arrived at the respective research location, they were asked to read the factsheet about the study and provide informed consent for their participation. Next, and depending on the condition that the participants were randomly assigned to, they were asked to sit at a table about 60 cm from a desktop PC or a smartphone docking station. Participants' eye movements were recorded by the eye tracker that was either located below a 24.0-inch desktop screen (with a resolution of 1,920 × 1,080) or below a smartphone (5.0-inch screen size, 720 × 1,280 resolution). This setup permitted free head movement and normal mobile usage. We used Tobii X2 30 Hz Eye Tracker in all three conditions to ensure data comparability. For the eye tracker calibration, a 9-point calibration procedure was used in all conditions, meaning that participants were asked to look at numbers on a plate to ensure that their eye movements were measured precisely. Participants were then asked to read instructions on the screen and to click "next" to get to the newsfeed that they could freely scroll through without a time limit. When finished, participants took a post-test survey on a separate laptop. The procedure took about 30 min, and participants could receive research credits or a monetary incentive (EUR 5.00).

Stimulus

This study applied the Newsfeed-Exposure-Observer (NEO) Framework (Ohme & Mothes, 2020) to generate a feed that resembled a Facebook newsfeed. The framework is an application that stores predestined information in a database (i.e., headline, text, and picture) and uses a designated stylesheet to create a responsive HTML website of the newsfeed to allow for an optimized page display on different devices. Hence, we did not need to rely on still images to create a newsfeed, as the website automatically adjusted to the mobile screen specifications and produced a scrollable feed. The posts were displayed in a fixed order, were not linked to the respective content (i.e., participants could not click on the posts), and contained the post elements of a typical Facebook newsfeed post, as in *source, header, title*, *picture*, *likes*, and *reactions* including their "organic", non-manipulated engagement metrics, pictures, headers, etc. (see Figure 1). We used a Facebook newsfeed due to its popularity in the Netherlands (e.g., Newman et al., 2019, p. 97), widely known layout, and posts usually containing more information than platforms with a strong visual focus, such as Instagram.

We used 18 posts that had previously appeared on Facebook's newsfeed in the two weeks before the field time and were selected by the researchers based on the three content criteria: Following Vraga et al. (2016) and to resemble a realistic newsfeed with a mixture of topics, six posts were social posts that referred to participants' living circumstances (e.g., the city they live in and daily life content), six other posts were miscellaneous news posts, reporting on celebrities, records, and crimes (e.g., "Officials find massive cocaine shipment hidden among bananas"), and six posts were political news posts, dealing with topics from recent political discussions about (1) melting glaciers, (2) repatriating ISIS members, and (3) plastic pollution in the sea. The newsfeed also contained one post depicting an ad for a granola bar (see all posts in Appendix 1). The sponsored post was not analyzed in this study as it was specifically created for and included in another study that focuses on the attention to sponsored posts on mobile devices (Maslowska et al., 2021).

Measures

We measured the visual attention to predefined AOIs with two metrics: (1) *dwell time*, as in the total amount of time the participant gazed on the specific AOI in milliseconds and (2) *number of fixations*, as in the "count of the number of fixations—or brief periods where the eye is (relatively) motionless—upon a stimulus or region within a stimulus" (King et al., 2019, p. 152). Prior research shows that dwell time and number of fixations are valid indicators of visual attention, whereas dwell time encompasses "the time spent on all fixations, saccades, and revisits" (Mahanama et al., 2022, p. 9) of an AOI and number of fixations, as a fixation-based metric, offers us a deeper understanding of subsequent cognitive processes (Just & Carpenter, 1980) as they show how strongly participants kept or returned their attention to certain parts of the stimuli. Given their difference in meaning and as a scrutiny check that our results are not driven by a single measure, we report both measures throughout the article. This also helps to connect our findings to previous and upcoming research, because both metrics are frequently used in eye-tracking research complementary. The predefined AOIs in this study encompassed (1) the whole *newsfeed post* and (2) the different social media *post elements* within a standard newsfeed post, including the *source*, *header*, *picture*, *title*, *likes*, and *reactions* (see Figure 2).

With our research interest and comparative design not focusing on inter-post/content-related differences but on device and environmental differences, we summed up the *dwell time* spent on and *number of fixations* on the whole newsfeed and the previously specified social media newsfeed post elements of all 18 newsfeed posts (excluding the ad post). For a simplified interpretation, we converted the *dwell time* from milliseconds to seconds by dividing it by 1,000. These new metrics of *dwell time* and *number of fixations* for the whole *newsfeed post* and specifically each *post element* were then used in the condition comparisons of device (desktop and mobile) and smartphone usage environment (private and public). In addition, as a robustness check, we augmented the measure of visual attention given to individual post elements with the varying AOI sizes of the respective post elements by multiplying the visual attention metrics with the average relative size that the post element took up in an average newsfeed post (see Figure 2).[2]

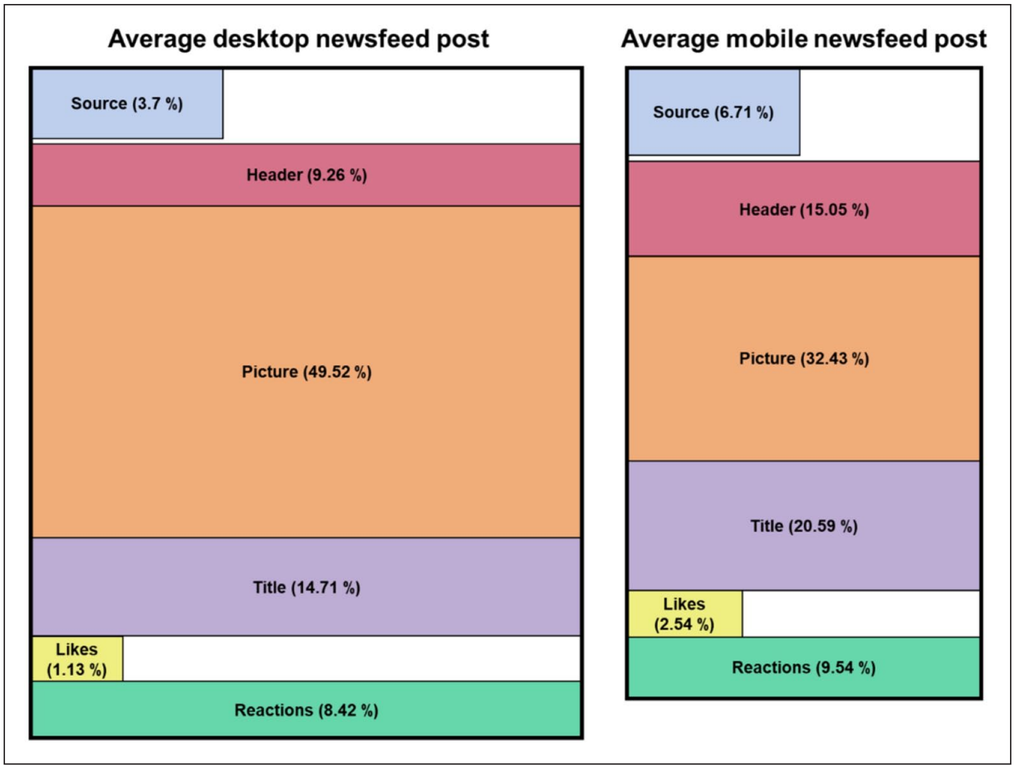

Figure 2. Average relative size of the newsfeed post elements compared to the whole post (100%) by device.

Table 1. Differences in Newsfeed Attention across the Two Comparisons.

	Desktop (private) ($n=63$)		Mobile (private) ($n=59$)		Mobile (public) ($n=79$)		t	df	p
	M	SD	M	SD	M	SD			
Device comparison									
Dwell time in seconds	161.11	56.08	170.87	58.33			−.942	120	.348
Fixations in frequencies	476.43	171.68	448.61	176.51			.882	120	.379
Usage environment comparison									
Dwell time in seconds			170.87	58.33	183.15	75.51	−1.038	136	.301
Fixations in frequencies			448.61	176.51	511.46	210.65	−1.856	136	.066

Results

Before elaborating on the comparisons, we provide an overview of how participants generally allocated their attention to the newsfeed in the different conditions. In sum, the participants' allocation of visual attention to the complete Facebook newsfeed did not differ significantly across the three conditions (see Table 1).

Hence, we now turn to the device and usage environment comparisons on the level of newsfeed post elements.

Device Comparison

The first research question asked whether there were differences in the visual attention allocated to newsfeed post elements between a desktop and a mobile newsfeed. We ran independent t-tests with the visual attention metrics, *dwell time in seconds* and *number of fixations*, grouped by the device condition and with the same environmental condition (i.e., desktop and mobile in a private setting; see Table 2 and Figure 3).[3]

When breaking down *dwell time* by post element, the *dwell time* was longer for nearly all post elements from the mobile newsfeed—except for the *picture*. The respective independent and Welch's t-test analyses indicated that these differences were statistically significant for the post elements *picture*, *title*, *likes*, and *reactions*, with the effect sizes ranging from small to large (Cohen, 1988; see Table 2). In line with *dwell time*, participants on the desktop newsfeed *fixated* significantly more frequently on the

Table 2. Differences in Attention by Device Condition ($N = 122$).

	Desktop (private) ($n = 63$)		Mobile (private) ($n = 59$)		*t*	*df*	*p*	*d*
	M	*SD*	*M*	*SD*				
Dwell time in seconds								
Source	8.40	5.57	10.26	4.90	−1.951	120.00	.053	–
Header	48.66	21.48	53.32	21.66	−1.193	120.00	.235	–
Picture	47.94	21.70	38.79	20.20	2.407	120.00	.018	.436
Title (*w*)	42.77	16.18	52.12	23.73	−2.524	101.49	.013	−.463
Likes (*w*)	2.49	1.73	4.85	3.84	−4.324	79.59	.000	−.801
Reactions (*w*)	3.02	1.56	5.89	3.12	−6.375	84.00	.000	−1.178
Fixations in frequencies								
Source	24.32	16.71	23.95	13.17	.135	120.00	.893	–
Header	159.59	75.38	149.14	68.65	.799	120.00	.426	–
Picture	127.03	58.57	93.98	54.21	3.228	120.00	.002	.585
Title	134.51	56.67	143.81	71.86	−.797	120.00	.427	–
Likes (*w*)	6.19	4.17	12.51	10.81	−4.205	73.94	.000	−.781
Reactions (*w*)	7.25	4.59	12.56	7.79	−4.545	92.62	.000	−.837

Note: Cohen's *d* (*d*) is reported for significant independent *t*-tests. Due to significant Levene's tests (see Appendix 2), multiple Welch's *t*-tests were calculated (*w*).

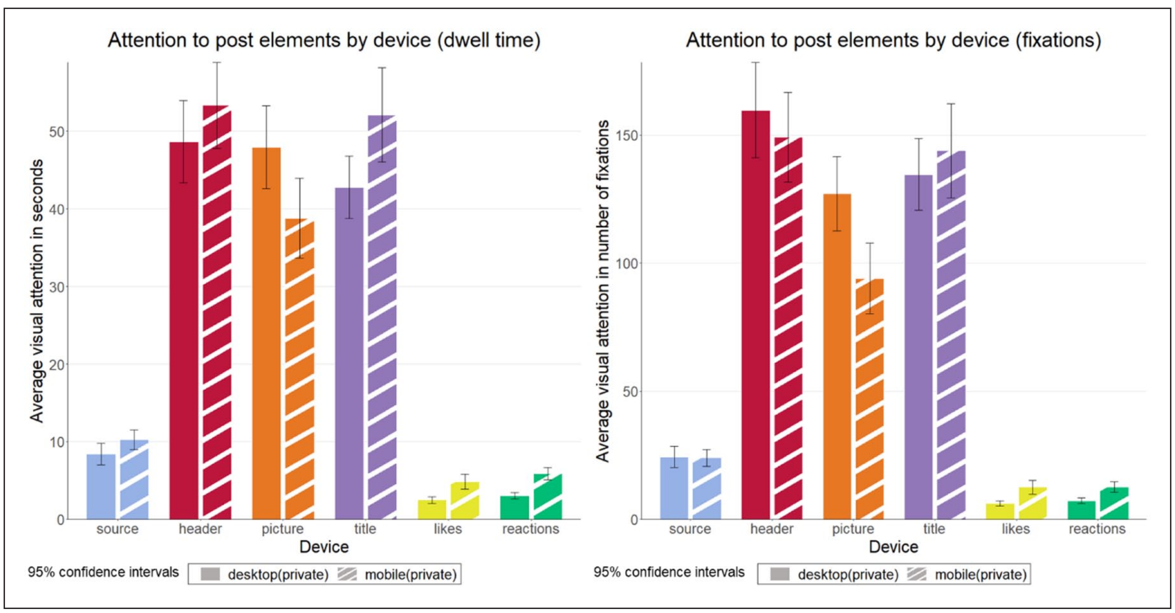

Figure 3. Differences in attention to post elements by device condition.

picture and less on the post elements *likes* and *reactions* than on the mobile newsfeed. The independent and Welch's *t*-test analyses of the *number of fixations* on the post elements *picture, likes* and *reactions* determined significant differences between the devices with effect sizes ranging from medium to large.

Since we found significant differences in the visual attention allocated to specific social media post elements between devices, we performed a robustness test with the relative attention given to the post elements as the dependent variable. In summary, the *t*-test analyses with the relative visual attention metrics confirmed the previously significant differences and general tendencies in the visual attention allocated to specific newsfeed post elements by device and yielded additional significant differences for the post elements (see Appendices 3 and 4). Most noticeable is the post element *picture*, which shifts to gaining the relatively highest amount of visual attention—especially on the desktop newsfeed.

Table 3. Differences in Attention by Usage Environment Condition ($N = 138$).

	Mobile (private) ($n = 59$)		Mobile (public) ($n = 79$)		*t*	*df*	*p*	*d*
	M	*SD*	*M*	*SD*				
Dwell time in seconds								
Source	10.26	4.90	11.61	5.58	−1.480	136.00	.141	-
Header	53.32	21.66	65.18	28.30	−2.685	136.00	.008	−.462
Picture	38.79	20.20	31.71	18.70	2.124	136.00	.035	.365
Title	52.12	23.73	61.39	28.03	−2.051	136.00	.042	−.353
Likes	4.85	3.84	4.46	4.09	.566	136.00	.572	-
Reactions	5.89	3.12	4.63	3.06	2.387	136.00	.018	.411
Fixations in frequencies								
Source (*w*)	23.95	13.17	31.22	17.23	−2.807	135.91	.006	−.465
Header	149.14	68.65	192.59	87.60	−3.155	136.00	.002	−.543
Picture	93.98	54.21	77.56	46.18	1.918	136.00	.057	-
Title	143.81	71.86	178.22	79.46	−2.620	136.00	.010	−.451
Likes	12.51	10.81	11.00	10.09	.842	136.00	.401	-
Reactions	12.56	7.79	10.97	8.07	1.158	136.00	.249	-

Note: Cohen's *d* (*d*) is reported for significant independent *t*-tests. Due to a significant Levene's test (see Appendix 2), a Welch's *t*-test was calculated (*w*).

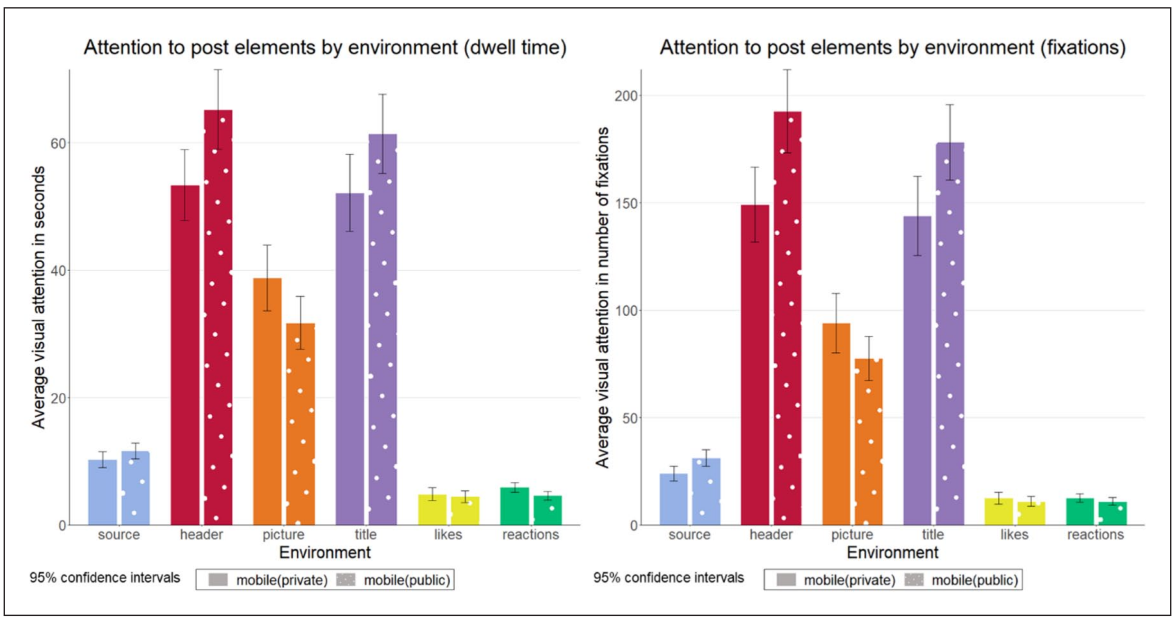

Figure 4. Differences in attention by usage environment condition.

This provides additional evidence that people dedicate different levels of attention to post elements when they scroll through a social media newsfeed on different devices.

Usage Environment Comparison

The second research question asked whether participants paid attention to newsfeed post elements differently in a private or public setting. We ran independent *t*-test analyses with the visual attention metrics, *dwell time in seconds*, and *number of fixations*, for the different newsfeed post elements grouped by smartphone usage environment, that is, participants scrolling through the mobile newsfeed in a secluded lab (private) or in the university's cafeteria (public; see Table 3 and Figure 4).

Participants attended longer to the *post elements* containing textual information (i.e., *source*, *header*, and *title*) in the cafeteria. This was significantly longer in the case of *header* and *title*. In contrast, the post elements *picture* and *reactions* differed significantly depending on the usage environment, with participants dwelling longer on them on a smartphone in the lab setting than in the cafeteria (see Table 3). The effect sizes were small. The post elements containing textual information (i.e., *source*, *header*, and *title*) were also *fixated* on significantly more frequently in the cafeteria—with effect sizes spanning from small to medium.

In addition to the general level of all newsfeed posts, we probed the data further by looking at the attentional differences within the three different newsfeed post types, *social*, *political*, and *news* (in orientation to Vraga et al., 2016). However, no systematic patterns emerged throughout both research questions, which leads us to believe that the differences based on the tested conditions are somewhat consistent throughout various post types.

Discussion

With the activity of scrolling through a newsfeed becoming ever more embedded in users' daily lives (Newman et al., 2022), newsfeed posts have become important informational units in the digital platform ecology. For a long time, research has worked to understand how frequently users rely on social media to inform themselves or be entertained (Hossain, 2019). More recently, research has focused on attention to social media posts, acknowledging differences between exposure and attention, for example, for persuasion and knowledge (Ohme, Maslowska, & Mothes, 2022; Stroud et al., 2022). Yet, even these highly valuable approaches have treated social media posts as whole, uniform informational units. However, each post consists of different elements that are important indicators for the selection and effect of messages on the users, e.g., the *source* when deciding to trust information (Sülflow et al., 2019). Our study—comparing users' attention to social media newsfeed post elements between different devices and usage environments—now adds that smartphones and public exposure environments are responsible for differences in the attention users dedicate to specific post elements.

When looking at significant attentional differences across devices, the *time spent* with post elements is higher on smartphones relative to desktops with two exceptions: For the *picture* as the main visual anchor of a social media post, we find less *dwell time* and fewer *fixations* (see similar findings by Keib et al., 2022). This difference is also corroborated by our additional robustness check that used visual attention metrics weighted by the AOI-size of the post elements. Pictures in mobile-optimized newsfeed environments may be easier to process and require less attention. Furthermore, the differences between devices regarding a post's *title* are less straightforward. Users *dwelled* longer on the *title* but did not systematically *fixate* more frequently on that kind of information on smartphones. While studies that find lower knowledge gains from smartphone exposure to information consider that mobile devices lead to textual information receiving less attention (Kruikemeier et al., 2018; Ohme, Maslowska, & Mothes, 2022), our study reveals that post elements with textual information are generally attended to for longer on smartphones than on the desktop—possibly because of the generally longer time necessary to process these more dense information (see Eye-Mind Hypothesis) as well as the perceptive restrictions caused by the mobile device (Ohme, 2020).

Overall, we found consistently and significantly greater attention paid to textual elements when users scrolled through a newsfeed on a smartphone in a bustling student cafeteria (public) compared to a quiet lab (private) setting. The attention paid to other post elements, such as *pictures* or *likes*, did not consistently differ between contexts—presumably because they require, in general, fewer cognitive resources and shorter time to process than text (Azizian et al., 2006; see here also Paivio, 1986; Paivio & Csapo, 1973). The higher levels of attention to *title* and *header* (and *source* in the case of fixation frequency) can potentially mean two things. First, public environments enable a higher interest in text, potentially because the sonar level of ambiance noise enhances processing (Angwin et al., 2017), or the social presence of others increases the relevance of social utility cues of information that can be mainly found in text (Chaffee & McLeod, 1973). Second, visual and audible distractors in a public environment create the cognitively taxing environment that other studies have suggested (Steil et al., 2018). Therefore, the taxing public environment may make users spend more time with textual information because they need more time to extract information from these post elements (Potter et al., 2014; Zhao et al., 2020) relative to visuals. It could be encouraging to see that users in public environments take the time they need to process textual information (and potentially learn more from it, see Ohme, Searles, & de Vreese, 2022). However, no time pressure was present in our study design. In situations with time pressure, being on the go, or in a check-out queue, visual and audible distractors may affect information processing and, thus, complicate focusing on text in mobile news environments. Taking the assumptions of the Multiple Resource Theory (Wickens, 1984) into account, this means that while the exposure situation (i.e., social co-presence, auditory, and visual distractors) *does* lead to differing attentional patterns of social media users, it does not necessarily result in lower visual attention given to newsfeed elements, but to users being more selective in the attention they dedicate to specific elements of a post.

Overall, our study adds essential findings about attention to social media newsfeeds in a mobile news environment. Focusing on social media elements provides us with more insights regarding attentional differences that smartphones and public usage environments entail for users. In addition, our study shows that on smartphones, users generally pay less attention to *pictures*; when used in public, they focus more on textual post elements relative to private situations. Previous research found that attention to newsfeed information does not significantly differ when considering the whole newsfeed post as an area of attention. Now, our study suggests that within-post differences exist *on the level of single post elements* like *source, picture*, or *headline* and that these differences need to be taken into consideration when trying to understand smartphone-driven information exposure on a granular, newsfeed element-based level.

Limitations and Future Directions

The results need to be reviewed, considering the study's limitations. First, our study is based on a convenience sample of university students. Hence, it is unclear whether users of broader sociodemographics, for example, age, education, or even tech-affinity, vary in how they allocate attention to the different post elements of a social media newsfeed under the tested conditions. With an aging population of Facebook users and generational differences in the perceived ease of use of electronic devices, it would be fruitful for future research to investigate these fundamental differences in attentional allocation depending on different usage conditions with a representative sample. Similarly, the general attentional tendencies as well as the intriguing role of the post element *picture* observed in this study could be explored in the context of other social media platforms with a stronger focus on visual communication, which are gaining relevance especially among younger age groups, such as TikTok and Instagram.

Second, although this study applied a scrollable newsfeed with the help of the NEO-Framework (Ohme & Mothes, 2020), which was filled with actual Facebook posts stemming from the participants' city to heighten the realism of the user experience, the newsfeed was not personalized. The forced exposure may have further contributed to the artificiality of the study experience. This means we can only assume that the differences in attention allocation between the conditions occur when users are confronted with a mostly unfamiliar newsfeed. Yet, the attempted ecological validity of the study, using real news posts and a dynamic newsfeed, goes beyond the designs of most prior experimental eye-tracking studies. Furthermore, despite our newsfeeds containing a somewhat realistic randomness of content in social, political, and miscellaneous (Vraga et al., 2016), and post elements' characteristics (i.e., the number of likes, visual composition, and text length) throughout the posts, the stimuli did not include any indications of possible comments underneath the posts. With regard to the newsfeed stimulus, we focused on securing internal validity by keeping (1) the amount of post elements that would typically be found in a Facebook post in the newsfeed consistent, that is, there was no post without a title or picture, and (2) the distribution of political posts consistent, which may have affected external validity (cf. Vraga et al., 2015; Wojcieszak et al., 2024). Nonetheless, our results provide general tendencies to which newsfeed post elements users pay attention to in different conditions and can lay the groundwork for more detailed research on the attention to one manipulated newsfeed post element on specific devices and in different usage environments. Future studies could follow Vergara et al. (2021) and track participants' visual attention while scrolling through their own newsfeeds and examine whether varying the presence of certain post elements and political content significantly impacts attention. Similarly, and with the established attentional differences in this study as a first step, future research could also focus on more specific differences in the post content (e.g., dramatized headlines vs. non-dramatized headlines, high vs. low number of likes, emotionality of post), and look into how variations of post content interact with device and environment.

Third, while eye-tracking technology offers a range of new possibilities to measure attention as a prerequisite of information processing and message effects, it is obtrusive by nature and requires prior calibration. Also, the necessary briefing of the participants before starting the experiment could have influenced how participants would usually scroll through a newsfeed. Furthermore, and keeping in mind that this study is one of the first studies exploring attention to mobile social media newsfeeds in a non-secluded setting, the external circumstances of the cafeteria were variable—with the number of people and noise levels varying throughout data collection. In future research, the different ecological, external, and internal validity trade-offs must be continuously reflected and adapted for research design purposes.

Fourth, and concerning our operationalization of private vs. public environments, we also acknowledge that, while we selected two very typical situations with varying levels of distractions and social co-presence, these are only two situations based on a large spectrum between private and public settings—not all private environments are necessarily quiet and without a distraction, and not all public environments are noisy. Similarly, we are not able to make statements about the differences between audible or visual distractions—as two of the three factors in distinguishing public settings—and encourage future research to study these and their effects on visual attention given to post elements and subsequent cognitive processes, e.g., based on the Cognitive Theory of Multimedia Learning (Mayer, 2014), in greater detail.

An unexpected finding of our study was that the visual attention allocated to a desktop newsfeed in the private setting and a mobile newsfeed in the public setting showed somewhat similar patterns. Future research is necessary to validate this claim and to further explore why this might be the case. Also, while scrolling through a newsfeed on a desktop PC in a public usage environment such as the cafeteria or in a subway is highly unlikely, future studies could investigate the comparison based on larger tablets or laptops.

Nonetheless, the study provides first comparative insights into how users' visual attention to social media newsfeed posts and post elements is allocated on different devices (desktop and mobile) and in various usage environments (private and public). The differences we find, especially between visual and textual information, may contrast the common understanding that a mobile age is also a visual age and that—if one wants the attention of their users, especially in public environments—words can be more effective than pictures.

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Notes

1. While the calibration of the eye tracker was overall unproblematic, for some participants it was difficult to collect enough gaze information to allow for a meaningful analysis (see King et al., 2019, for a discussion on calibration issues).
2. For example, one participant scrolling through the mobile newsfeed dwelled an average of 11.54 s on the newsfeed post element *source*. This *dwell time* was augmented by the AOI size of the post element *source* by multiplying it with the average relative size that the *source* took up in the average mobile newsfeed post (6.71%).
3. Due to the nature of eye-tracking data, we also ran Mann–Whitney U tests. Because the significant results and the corresponding median differences' tendencies matched those from the independent *t*-tests and the average distribution of visual attention in most cases, we report the results from the independent *t*-tests for comprehensibility and interpretability purposes.

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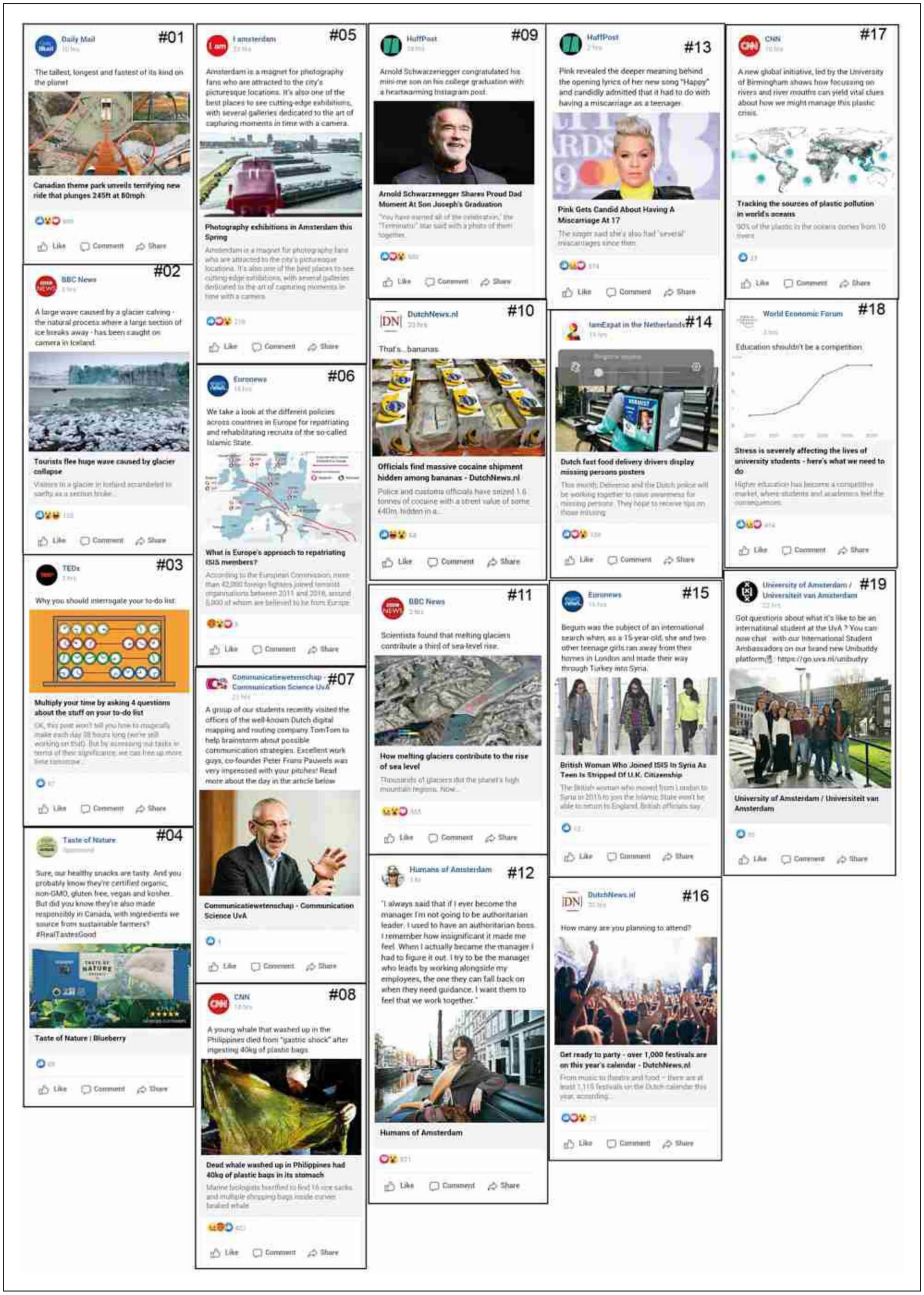


Appendix 1. Posts numbered by order of appearance in the newsfeed.

Appendix 2. Levene's Tests for the *t*-Test Analyses.

	RQ1 (*N* = 122)		Control (*N* = 122)		RQ2 (*N* = 138)	
	F	*p*	*F*	*p*	*F*	*p*
Dwell time in seconds						
Post	.061	.806	.061	.806	2.208	.140
Source	1.078	.301	25.500	.000	.150	.699
Header	.015	.903	14.774	.000	3.083	.081
Picture	.048	.826	9.442	.003	1.641	.202
Title	6.686	.011	22.343	.000	.982	.323
Likes	15.387	.000	39.054	.000	.067	.796
Reactions	17.964	.000	23.530	.000	.022	.882
Fixations in frequencies						
Post	.023	.880	.023	.880	1.862	.175
Source	.040	.841	12.697	.001	4.151	.044
Header	.362	.548	10.046	.002	1.970	.163
Picture	.004	.947	7.758	.006	3.601	.060
Title	1.545	.216	11.779	.001	1.031	.312
Likes	17.863	.000	38.462	.000	.005	.946
Reactions	10.197	.002	14.736	.000	.049	.825

Appendix 3. Differences in Attention Weighted by AOI-Size by Device Condition (Control).

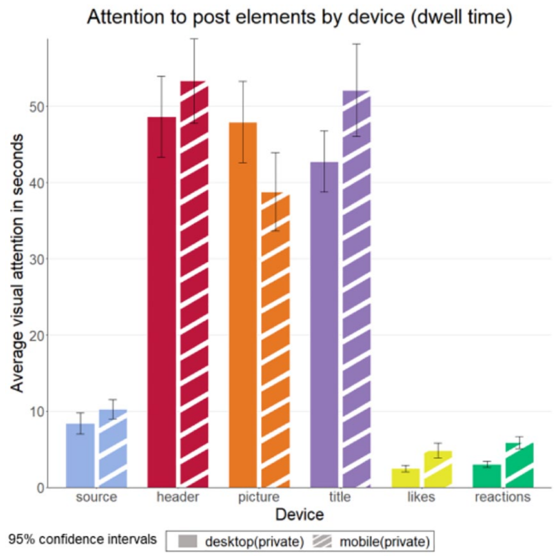
	Desktop (private) (*n* = 63)		Mobile (private) (*n* = 59)		*t*	*df*	*p*	*d*
	M	*SD*	*M*	*SD*				
Dwell time in seconds								
Source (*w*)	.31	.21	.69	.33	−7.540	96.31	.000	−1.386
Header (*w*)	4.51	1.99	8.02	3.26	−7.139	94.71	.000	−1.313
Picture (*w*)	23.75	10.75	12.58	6.55	6.980	103.52	.000	1.245
Title (*w*)	6.29	2.38	10.73	4.89	−6.312	82.81	.000	−1.167
Likes (*w*)	.03	.02	.12	.10	−7.347	62.39	.000	−1.372
Reactions (*w*)	.25	.13	.56	.30	−7.314	78.61	.000	−1.355
Fixations in frequencies								
Source (*w*)	.90	.62	1.61	.88	−5.090	103.10	.000	−.933
Header (*w*)	14.78	6.98	22.44	10.33	−4.771	100.94	.000	−.875
Picture (*w*)	62.93	29.02	30.48	17.58	7.525	103.19	.000	1.343
Title (*w*)	19.79	8.34	29.61	14.80	−4.478	90.15	.000	−.825
Likes (*w*)	.07	.05	.32	.27	−6.836	61.20	.000	−1.278
Reactions (*w*)	.61	.39	1.20	.74	−5.423	85.89	.000	−1.001

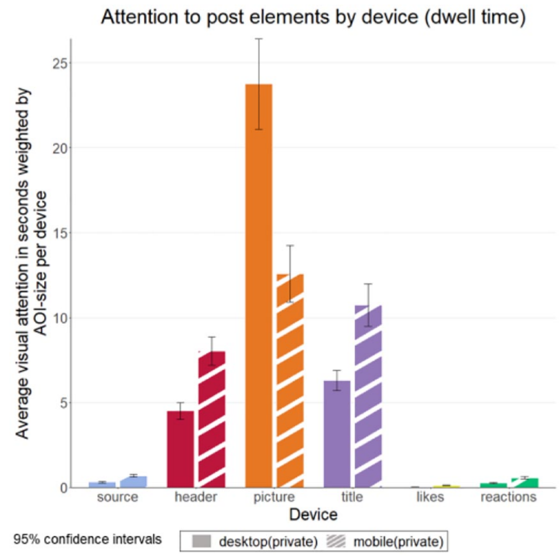
Note: Cohen's *d* (*d*) is reported for significant independent *t*-tests. Due to significant Levene's tests (see Appendix 2), multiple Welch's *t*-tests were calculated (*w*).

Appendix 4. Comparison of the Differences in Attention by Device Condition (RQ1) and the Differences in Attention Weighted by AOI-Size by Device Condition (Control).

RQ1 | Control

Dwell time in seconds





Fixations in frequencies