NEURO-INSIGHT

Standing out from the crowd: How digital is changing the OOH advertising landscape

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Introduction

The role of advertising in society has long been the subject of debate (Taylor, 2015). With the ability to influence the behavior of consumers, marketing and communication have become important considerations for practitioners and researchers alike (French & Gordon, 2020; Kearns & Andrews, 2021). Yet, businesses face the challenge of determining what, where, when, and how they communicate to consumers, whilst considering multiple, and often conflicting, objectives and constraints (Nader, Alexandrou, Iasonas, Pamboris, Papadopoulos & Konstantinidis, 2022). Consequently, selecting the most effective combination of media from a diverse set of communication options, remains a critical issue for marketers (Taylor, 2015; Roux, 2016; Cho, Cheon, Jun & Lee, 2022).

Out-of-Home (OOH) advertising is the oldest form of mass communication (Taylor, Franke & Bang, 2006), having evolved from ancient rock art in India (Surhone & Timpledon, 2010) and hierographic representations of shopkeepers' wares in ancient Egypt (Veloutsou & O'Donnell, 2005), with its first documented use in traditional billboard format in the U.S.A. during the 1850s (Wilson, 2022). OOH advertising remains one of the most widespread (Roux & Van der Waldt, 2014) and popular mediums of advertising (Nader *et al.*, 2022), representing an innovative and practical approach to educating and informing the general public (Wilson, Lohmeier, Lustick & Chen, 2021).

Historically, the OOH medium has been a static form of marketing communication, often printed on large-format paper and left unchanged for extended periods of time (Andrew, Haines & Seixas, 2019). Given the rising costs of internet-based advertising (Huo & Jiang, 2022), the advent of digital OOH (DOOH) advertising capabilities has revolutionized the industry (Taylor, 2015). OOH advertising has undergone somewhat of a renaissance by entering the digital era (Roux & Van der Waldt, 2016), with technology-driven developments unlocking new, exciting ways for brands to engage with consumers (Cho *et al.*, 2022). For example, many OOH locations now boast full-motion, high-resolution displays, which can broadcast dynamic imagery and content (Andrew *et al.*, 2019). In light of these developments, advertisers are beginning to recognize the potential impact and reach of OOH media (Roux & Van der Waldt, 2016). With the global DOOH market projected to reach an all-time high of over $58 billion by 2031 (Jangra, Upadhaya & Kumar, 2022), it is important that advertisers understand how it works, and what works best.

OOH advertising differs from other forms of media in that much of OOH-based information is transmitted incidentally to the consumer, in an indirect, passive manner (Wilson & Till, 2011). Importantly, OOH sites are often encountered 'on-the-go', where consumers are in a highly distracted state (e.g., driving along a highway or navigating through airport terminals; Wilson, Baack & Till, 2008). The impact of OOH has traditionally been assessed by measuring recognition and recall (see for example Fitts & Hewett, 1977; King & Tinkham, 1989; Donthu, Cherian & Bhargava, 1993; Wilson & Till, 2008). However, quantifying the impact of the OOH media experience and its inherent value requires attention (Joseph, Davey & Soman, 2016; Babst, Roux & de Jager, 2020). This has led to OOH being somewhat undervalued and underappreciated (Veloutsou & O'Donnell, 2005; Wilson & Till, 2011). Without an understanding of the true quality and impact of OOH, Andrew *et al.* (2019:589) argue that drawing real conclusions about OOH value and return on investment (ROI) is "almost impossible".

The notion of quantifying OOH impact was not lost on California-based WOW Media. WOW Media, who operate multiple DOOH sites at the top end

of the American market, sought to demonstrate the impact and value of their iconic DOOH sites within the context of the wider OOH landscape, whilst exploring how their innovative full-motion DOOH sites performed. Moreover, WOW Media wanted to scientifically quantify their sites' impact and establish a link to consumer behavior.

Study approach

Beyond standard industry metrics, such as the number of impressions, average dwell duration and other audience-related figures (see Roux & Van der Waldt, 2014; Roux, 2016), WOW Media sought robust data surrounding the quality of message delivery to better understand the true impact of their sites, and of the broader OOH industry. With over 90% of information that humans are exposed to processed subconsciously in the brain (Zurawicki, 2010), simply requesting a consumer's account of an event after the fact is unlikely to provide detailed insight into their cognitive processes (Olson & Zaltman, 2010). Furthermore, there are considerable concerns surrounding consumers' ability to clearly articulate and consciously identify the subconscious impact of messages (Andrew *et al.*, 2019). However, given recent developments in the measurement of subconscious processes, by applying physiological and neurophysiological measurement tools to research (Plassmann & Karmarkar, 2015; Cerf, Garcia-Garcia & Kotler, 2017), the mechanisms underpinning consumer cognition can be better understood (Olson & Kendrick, 2008; Blascovich, 2014), As such, WOW Media decided to explore an approach capable of quantifying the subconscious, emotional responses underlying consumer behavior.

The neuroimaging approach adopted offered a unique way of evaluating and quantifying phenomena which would otherwise be unobtainable. Specifically, WOW Media partnered with Neuro-Insight, neuromarketing and neuro analytics firm, with years of global experience in the OOH industry. Neuro-Insight uses a unique technology called steady-state topography (SST), which detects second-by-second changes in regional brain activity based on neural processing speeds (see Silberstein, Schier, Pipingas, Ciorciari, Wood &

Simpson, 1990; Silberstein, 1995, 1998; Silberstein, Harris, Nield & Pipingas, 2000; Silberstein & Nield, 2008, 2012). With its origins in the fields of cognitive and clinical neuroscience research, the scientifically validated metrics it produces are used by Neuro-Insight in its research endeavors.

According to Andrew *et al.* (2019), the SST methodology uses an electroencephalogram (EEG) headset alongside a 24-channel amplifier to detect and record electrical signals resulting from neural activity, and can be conducted in naturalistic conditions (ie, outside of a laboratory- or hospital-based setting). Given the roles of specific brain regions in cognition, Neuro-Insight reports on SST metrics contextually relevant to advertising. Within the context of this study, the emotional intensity and long-term memory encoding metrics were of interest, which are discussed in turn.

> Emotional intensity, which is derived from sites near the occipito-temporal border (Heller & Nitschke, 1998; Kemp, Gray, Eide, Silberstein & Nathan, 2002) and measures the strength of emotion experienced, with higher levels of emotional intensity facilitating improved information retention.
>
> Long-term memory encoding (LTM), which has been found to correlate with subsequent consumer behavior and is indicative of communication effectiveness (Silberstein & Nield, 2008), and is derived from the lateral prefrontal cortex (Brewer, Zhao, Desmond, Glover & Gabrieli, 1998; Buckner, Kelley & Petersen, 1999).

Each metric is independently measured, which produces plots of metrics based on the cumulated brain response from all participants (Andrew et al., 2019). The sample size for this study was 84 participants, which meets and indeed exceeds the sample size of N=50 as recommended by Andrew et al. (2019). This sample comprised an even mix of female and male participants, all aged 18–65, whom were representative of the general population. Participants were recruited through a third-party specialist recruiter, based on the sampling criteria provided.

Methodology

After being pre-recruited, a total of 84 respondents (40 male, 44 female) took part in the research. In response to the suggestion of Coldwell and Herbst (2004) to conceal the true purpose of the research, and thereby ensure data integrity, respondents were not made aware of the study's true focus (ie, to evaluate the impact of OOH media), but instead told that the study's focus was on their response to the external environment. While this is only in part truthful, this sought to ensure that participants would not respond atypically and prevent any priming effects from arising.

Whereas Andrew *et al.* (2019) took all respondents on a bus ride through the location of interest, where each OOH site was encountered and experienced in situ, this study required that all participants resided in the location of interest (Los Angeles), drove their own vehicle/s more often than using public transportation, and commuted the various localities of interest within the broader Los Angeles area. These requirements were enforced to ensure that all participants had encountered in situ the OOH sites of interest throughout the course of their day-to-day routines.

Upon arrival at the research facility, and once consent was given, each respondent was asked to watch a short, 24-minute film of an inner-city car journey through Los Angeles, which featured the OOH sites of interest. In keeping with the approach used by Andrew *et al.* (2019), this design consideration was sought to leverage the power of mirror neurons. Mirror neurons, believed to be involved in imitative and empathetic processes in humans (Iacoboni, 2009), are suggested to fire when motor actions are performed, as well as when someone else is performing the same action (see Rizzolatti & Craighero, 2004; Fabbri-Destro & Rizzolatti, 2008; Mukamel, Ekstrom, Kaplan, Iacoboni & Fried, 2010). As such, by watching the filmed journey through Los Angeles, participants' neural activity would contain neural representations akin to their own experiences of the same journey, activated by their mirror-neuron systems (see Andrew *et al.*, 2019).

While watching the film, brain electrical activity was recorded from participants (see Silberstein & Nield, 2008), with the electrodes positioned in

accordance with the International 10-20 system (Andrew *et al.*, 2019). Additionally, participants were given a visor to wear, which emits a 13 Hz dim sinusoidal visual flicker, and used to elicit the steady-state visually evoked response (SSVEP; see Silberstein *et al.*, 2000; Silberstein & Nield, 2008).

As consumers pay varying amounts of attention to objects within the external environment (Orquin, Bagger, Lahm, Grunert & Scholderer, 2020), eye-tracking technology (ETT) was used to determine when participants looked at each site while watching the filmed journey. Prior literature has demonstrated the usefulness of ETT in understanding the role of visual attention in advertising (Thomsen & Fulton, 2007; Pieters, Wedel & Batra, 2010; Higgins, Leinenger & Rayner, 2014). To this end, ETT results were used to identify the windows during which each OOH site was encountered and used as a basis for the SST data relevant to each site. Throughout the filmed journey, each site was categorized into one of three groups for the purpose of analysis, comprising the following:

WOW Media "dynamic" screens (digital, no-motion sites)

WOW Media "full-motion" screens (digital, full-motion sites)

Standard sites not operated by WOW Media (not digital, nor multi-board)

As WOW Media only operate digital sites, "Standard sites not operated by WOW Media" were compared to WOW Media-operated sites at the overall level (ie, WOW Media sites versus Standard sites) to determine whether digital or traditional 'static' sites were more impactful. Within the context of this study, 'impactful' sites elicited a strong emotional connection among viewers with multiple peaks, delivered multiple peaks in long-term memory encoding, and evoked positive emotional responses. Prior research has identified these metrics to be predictive of advertising impact which, in combination, had a 0.86 correlation with in-market/econometric data (see Silberstein & Nield, 2008; Neuro-Insight, 2017).

When consumers are exposed to new information, neural processes become

operational and lead to context-relevant interpretations (Wyer, 2017; Prestwich, Kenworthy & Conner, 2018). Considering that DOOH sites are dynamic (ie, the evolving narratives and visuals provide new information), they are likely to deliver more peaks in neuro response, as well as driving more memory activity (Andrew *et al.*, 2019). Accordingly, it was hypothesized that digital (ie, full-motion and dynamic) sites would be more impactful than traditional, static OOH sites.

Performance of digital and static OOH

The results showed unequivocally that, in comparison to static sites, digital sites are likely to deliver a more powerful in-market impact, with more impressions encoded into long-term memory. Figure 1 indicates the strength of brain response for the sites evaluated in this study, where the peak responses for each site category were analyzed to understand their relative impact.

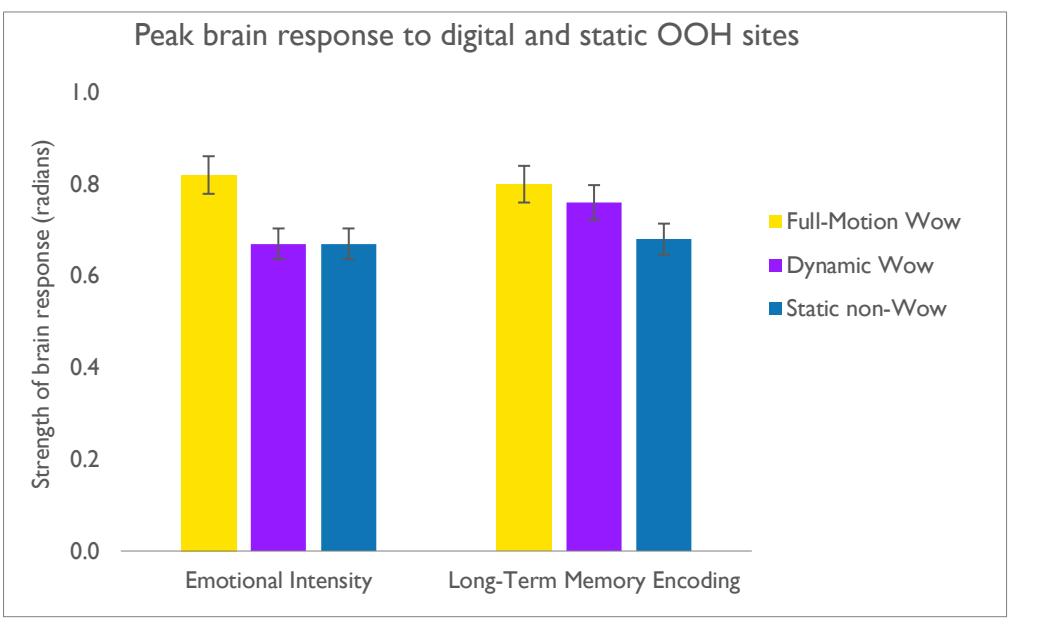

Figure 1. Summary of brain response to digital and static OOH sites in this study.

Despite digital and static sites having elicited strong, positive emotional

responses, digital sites (ie, full motion and dynamic) produced considerably more peaks of response overall. Whilst the number of peaks digital sites produced was greater than what the static sites produced, it was the full-motion DOOH sites which produced the most peaks, doing so with higher levels of intensity in long-term memory encoding and emotional intensity. Given the relationship between advertising memorability and subsequent consumer behavior (see Silberstein & Nield, 2008; Neuro-Insight, 2017), long-term memory encoding is central to evaluating the likely in-market impact of OOH advertising. As such, the higher long-term memory encoding levels for digital sites, particularly for full-motion digital sites, demonstrates a distinct performance advantage relative to static sites.

With reference to Silberstein and Nield (2008) and Neuro-Insight (2017), the Neuro Impact Factor (NIF) formula was applied to index the impact of each site category, which accounts for the levels of memory activity and emotional response, as well as the number of peaks observed in each (see Andrew *et al.*, 2019). In analyzing the brain responses to full-motion digital and static sites, a 5.8 times stronger impact for full-motion digital sites was revealed. Dynamic digital sites (ie, no-motion sites) were 2.4 times more impactful than static non-WOW sites (Figure 2).

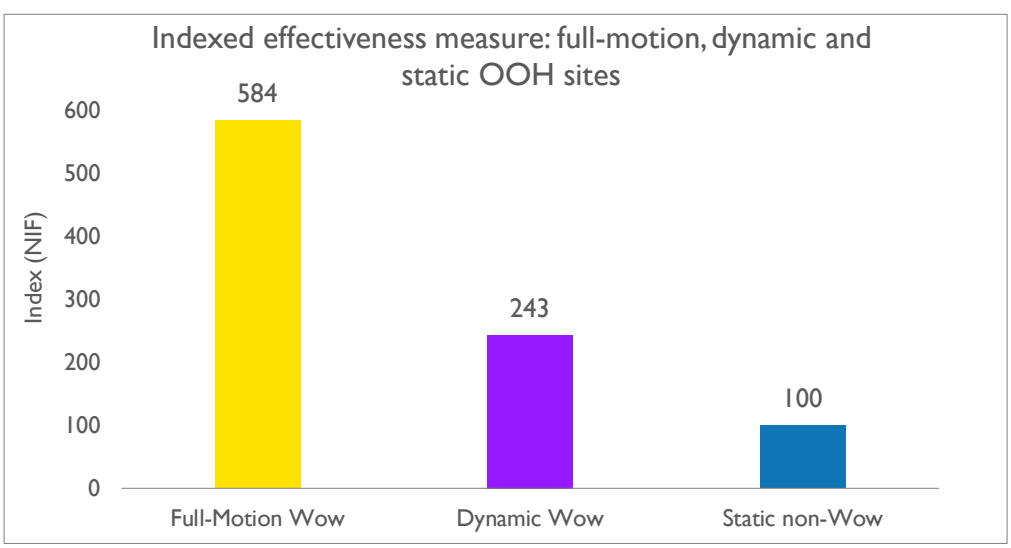

Figure 2. Indexed effectiveness of digital versus static OOH sites.

At an overall level, WOW's digital sites (whether full-motion or dynamic) were 3.2 times more impactful than static non-WOW sites. Notwithstanding the overall performance of digital and static sites, a small number of standard sites not operated by WOW Media indeed outperformed some of the digital screens operated by WOW Media. Overall, however, the results are consistent with the notion that digital OOH sites, both full-motion and multi-board, are more impactful than traditional, static sites.

According to Franke and Taylor (2017), the visibility of a OOH site is a significant driver of advertising spend. That is, high-visibility sites (ie, easy to see at any time of the day) generate the greatest interest from media buyers, given their ability to make a strong impression on consumers (Franke & Taylor, 2017). To enhance visibility, WOW Media's front-facing sites are centrally positioned (ie, placed directly above the road), whereas standard non-WOW sites are positioned laterally (ie, to the left- or right-hand side of the road, outside of consumers' natural line of sight). As such, WOW Media sought to quantify the value of front-facing sites which are positioned centrally in comparison to static sites which are positioned laterally.

Effect of positioning on site impact

Poorly positioned OOH sites can distract consumers as they commute, leading to undesirable consequences (Franke & Taylor, 2017). However, through strategically placed OOH media, sites can be seen by drivers and pedestrians alike, with adequate consumer exposure achieved (Taylor *et al.*, 2006; Roux & Van der Waldt, 2016). Accordingly, the NIF formula (see Silberstein & Nield, 2008; Neuro-Insight, 2017) was applied to assess whether site positioning influenced OOH impact. In analyzing the brain responses to WOW's centrally positioned sites and the laterally positioned non-WOW sites, a 3.6 times stronger impact for WOW Media's centrally positioned sites was revealed (Figure 3).

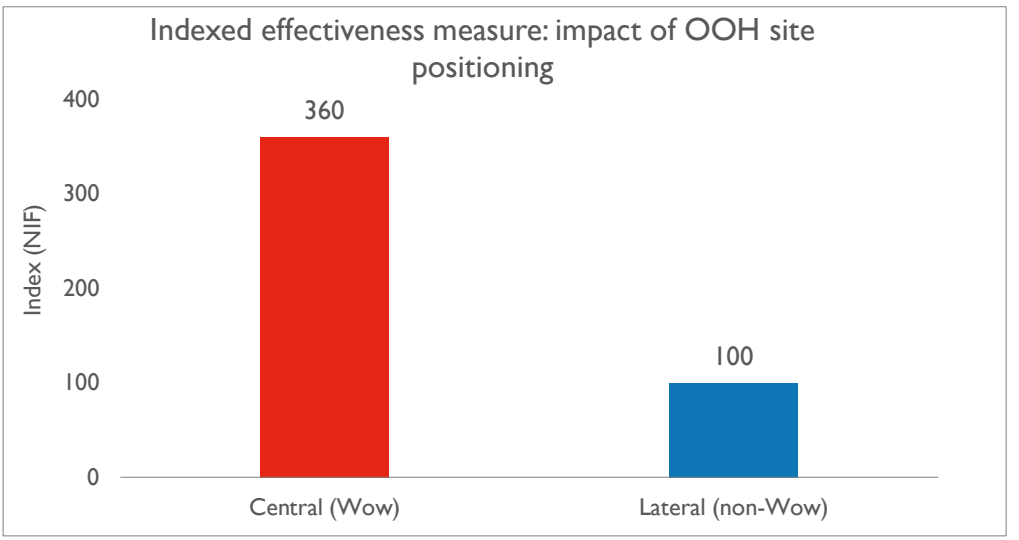

Figure 3. Indexed effectiveness of centrally and laterally positioned static OOH sites based on NIF developed to indicate in-market efficacy (see Neuro-Insight, 2017).

The results demonstrated that WOW Media's front-facing, centrally positioned OOH sites offer a distinct performance advantage relative to laterally positioned, static non-WOW sites. Furthermore, WOW's centrally positioned sites offer greater visibility, with the 'front-and-center' nature of their OOH sites facilitating enhanced and increased consumer exposure to advertisements. In addition to the advantages of digital-based OOH media, particularly full-motion digital sites, WOW Media's centrally positioned sites further enhances their DOOH offering.

Effect of interactive ambient lighting on OOH impact

Given the economic and technical requirements of successfully operating OOH systems (Schmid, 2020), establishing the value of ambient-lit OOH screens is of interest to advertisers. Again, the NIF formula was applied to establish whether ambient lighting influenced OOH impact (see Silberstein & Nield, 2008; Neuro-Insight, 2017). In analyzing the brain responses to ambient-lit and static sites, a 5.75 times stronger impact for WOW Media's ambient-lit sites

was revealed (Figure 4).

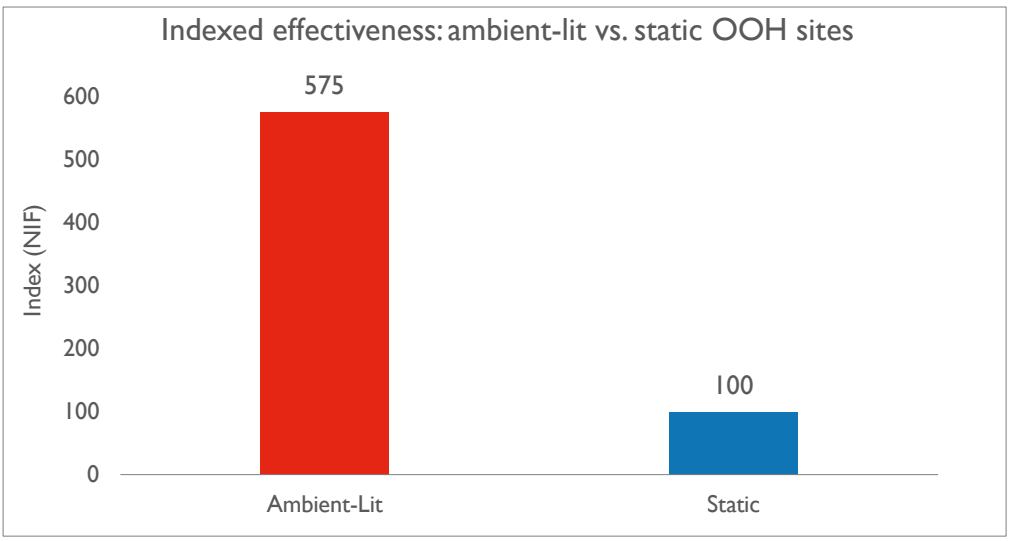

Figure 4. Indexed effectiveness of ambient lit versus static sites.

The results indicated unequivocally that ambient-lit digital sites delivered greater neuro responses than traditional, static OOH sites. This is attributed in part to the evolving narratives of digital sites, and in part to ambient lighting, which significantly accentuated OOH site performance. As highlighted by Lugmayr (2007), visual effects can immerse the audience in the viewing experience. To this end, the addition of ambient lighting to DOOH sites provides a highly immersive and visually captivating experience, which elevates memorability and advertising effectiveness. Moreover, this finding was of commercial importance to WOW Media, with the potential to provide them wider access to media-spending budgets. Additionally, results suggest that it would be in DOOH operators' interest to consider investing in infrastructure and technology to provide their sites with ambient-lighting capabilities.

In their research, Andrew et al. (2019) sought to further understand the impact of seeing a campaign first on digital screens and then on static screens, and vice-versa, finding that only the digital-first viewings had a positive priming effect

on subsequent viewings on static screens. Given that marketing decisions involve media selection and advertising scheduling, understanding the impact of repeat campaign viewings is of interest (see Mitchell & Olson, 1977; Bornstein, 1989; Schmidt & Eisend, 2015). To this end, this study set out to understand campaign repetition effects within the OOH context. That is, did repeat viewings of the same campaign on the same type of OOH site affect campaign performance?

Effect of campaign repetition in the DOOH context

The static nature of traditional OOH advertising complicates assessing repetition effects (Wilson & Till, 2011). On account of remaining unchanged for extended periods of time (Andrew *et al.*, 2019), the costs associated with purchasing multiple OOH sites for static-type campaigns are largely inhibitory. As such, only digital OOH campaigns were selected to investigate repetition effects. Importantly, campaigns were only included in this analysis if they were shown at least thrice, each time on a different WOW Media-operated digital screen. Given the role of memory in interpreting information and associative processes, the average of peak long-term memory encoding was used to assess the impact of campaign repetition (see Figure 3).

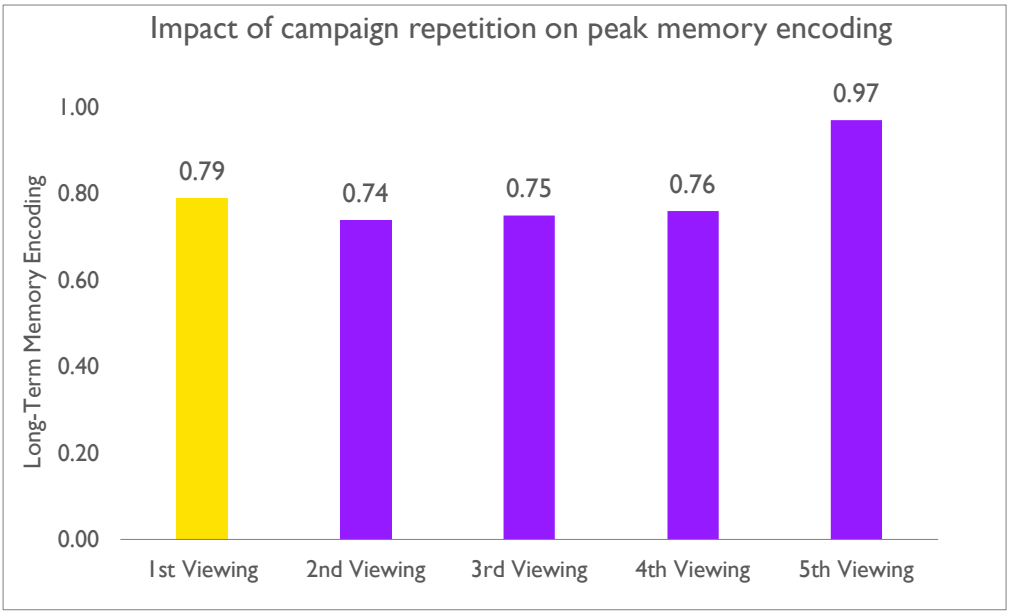

Figure 3. Impact of campaign repetition on long-term memory encoding.

The results indicate that, despite a marginal decline in long-term memory encoding from the first to second viewings of the same digital campaigns (non-significant; $p = 0.330$), memory encoding levels remained above the Neuro-Insight effectiveness threshold for advertising (see Silberstein & Nield, 2008; Silberstein, Seixas & Nield, 2020). Contrary to Dutta (2014) and Roux and Van der Waldt (2016), who attributed campaign-related wear-out effects to boredom caused by continuous campaign repetition, this study's findings indicate that the dynamic nature of DOOH sites provide a level of variation and uniqueness to campaigns, which appears to negate such effects. Further, these results showed promise for WOW Media and the wider DOOH industry, demonstrating that repeat viewings of campaigns on DOOH screens can indeed enhance advertising impact, with potential wear out not appearing to be an issue.

Conclusion

For marketers, selecting the 'right' combination of media with which to

communicate remains an open issue (Taylor, 2015; Roux, 2016; Cho *et al.*, 2022). With DOOH and pervasive technologies offering new ways of advertising, OOH operators and markets need to keep pace as the outdoor environment evolves (Stalder, 2011). As OOH sites are encountered by consumers in their day-to-day environments (Müller, Alt & Michelis, 2011), establishing how best to implement OOH advertising campaigns is important.

The present study quantified the impact of digital and static OOH sites, something which traditional self-report measures are unable to report on, encouraging practitioners and researchers to consider alternative approaches to OOH advertising and evaluation its efficacy. Compared to static OOH sites, DOOH sites generated more peaks in neuro response and drove more memory activity. Additionally, potential campaign wear-out effects appeared to be a non-issue for DOOH sites. On the contrary, repeat viewings of the same advertising campaign were shown to maintain its impact over time. Furthermore, the use of ambient lighting was shown to accentuate DOOH performance.

Taken together, this study has contributed to the understanding of the OOH advertising landscape, offering the means with which brands can communicate and connect with consumers, and quantifying how technological advancements and innovativeness can open more avenues to target media-spending budgets. With the pervasiveness of digital infrastructures, DOOH advertising has fast become a salient feature of the OOH landscape, with the OOH industry's role in the advertising universe more relevant now than ever.

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