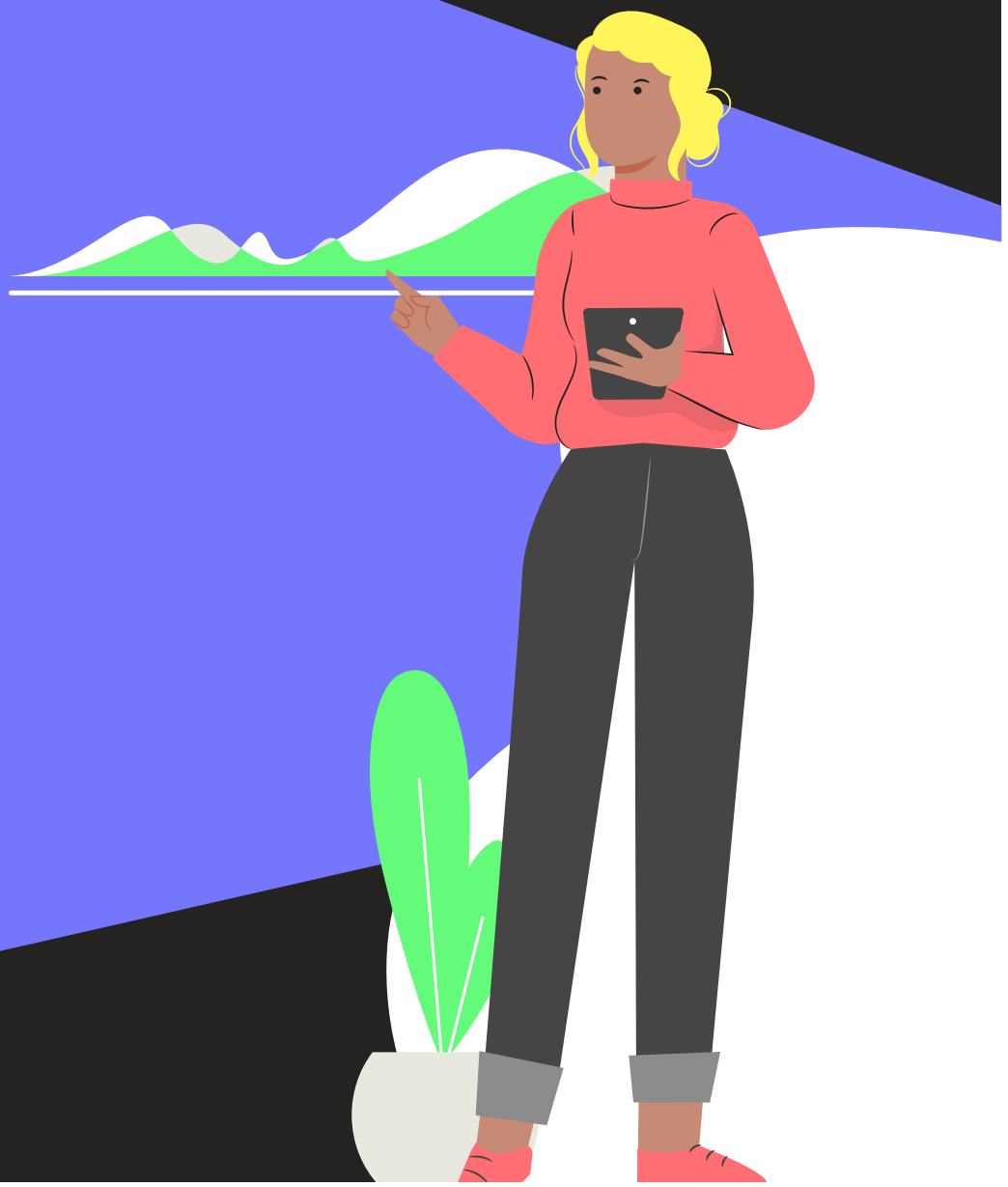
FINECAST

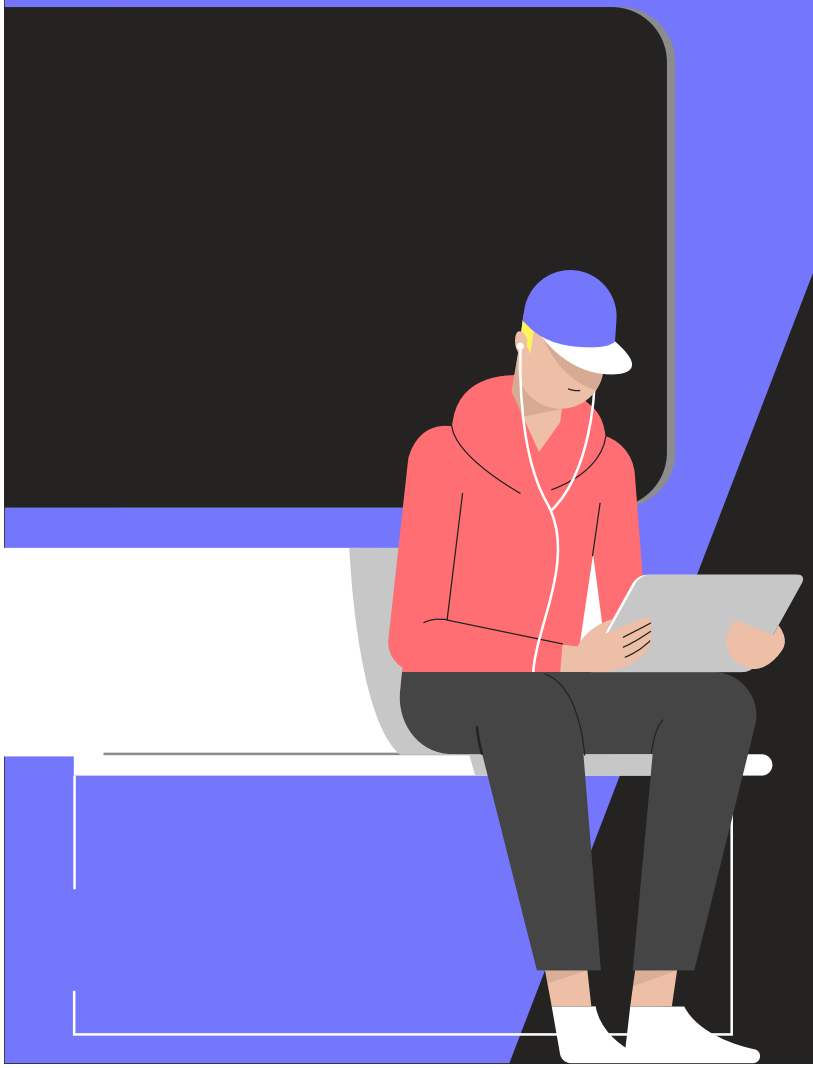
UCLC

Thinking Inside the Box

Lighting up neural networks: The brain's response to addressable ads



Introduction

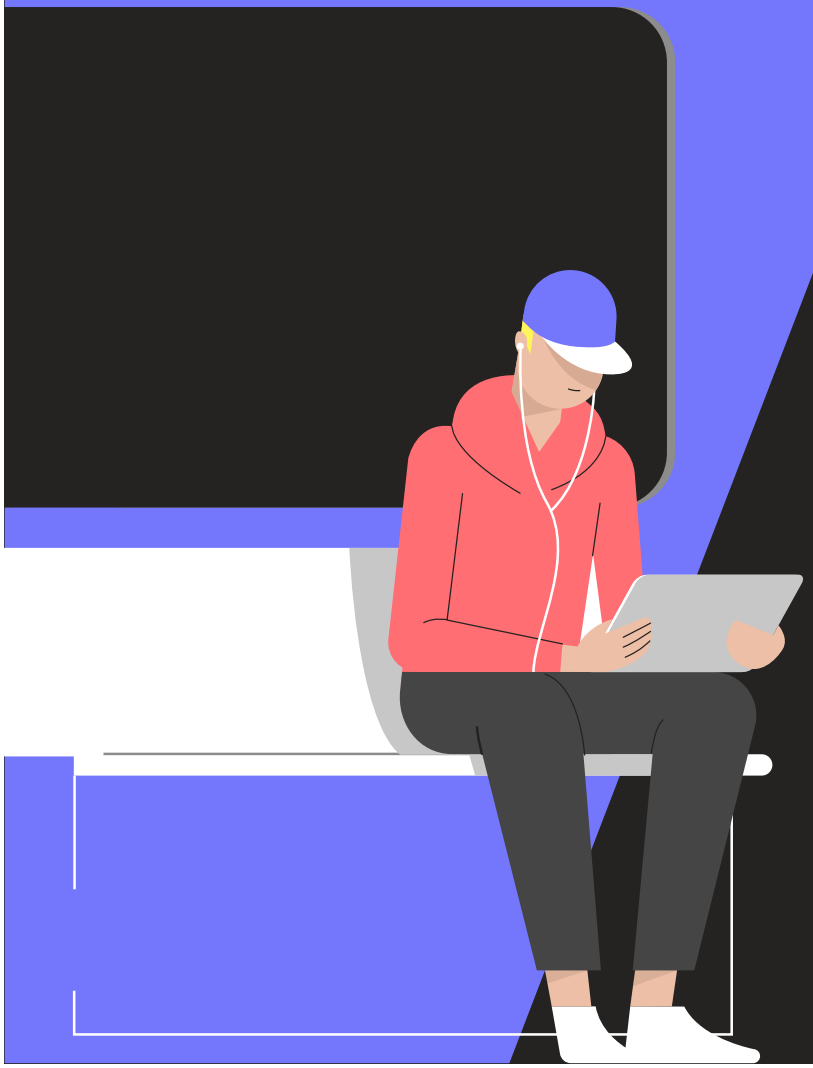


In 2007, Yankelovich, a leading Market Research firm, conducted a study which determined that the average person was exposed to around 5,000 advertisements each day. Fast forward to 2022, and many market researchers estimate the number to be as high as 10,000 ad impressions, per person, every single day.

With that being the case, how can you work smarter so that your advertising makes a lasting impression on your customers, rather than being just one forgotten message amongst 10,000 others?

One way for brands to make themselves memorable is through addressable TV. Addressable TV allows brands to show different ads to different households while they're watching professionally produced TV content, and over the past five years, Finecast has established itself as a leader in this field. We regularly publish case studies highlighting the positive results our clients achieve in brand awareness, consideration, website traffic, sales, etc. when running addressable TV campaigns with us. We're proud of these results and what they reveal about the effectiveness of addressable TV, but we're a curious bunch, and we wanted to know more; we wanted to know why. That's why in 2020, we launched Thinking Inside the Box (TITB), a series of research projects to delve deeper into understanding how the TV landscape is evolving and what this means for advertisers.

Introduction



Phases one through four of our TITB series included ethnography sessions with TV viewers and their opinion on TV advertising today and how it's changed, interviews with industry leaders and neuroscience experiments with UCL professors to understand how viewers respond to TV ads in different contexts, research into brand perception and viewer engagement, and finally, research into what factors drive attention. (More information, including videos, white papers and executive summaries of phases one through four, can be found here).

Our latest study, and phase five of our TITB research, sought to investigate why addressable TV is so effective. Is there something special that happens in a person's brain when they see a relevant ad, something that makes it particularly memorable? To answer these questions, we partnered with professors of neuroscience from University College London (UCL) to carry out two experiments exploring the impact of addressable ads. The outcomes of the study were impressive and have significant implications for the media industry. They shed light on why addressable TV campaigns continually achieve substantial results for clients, and they provide further evidence that addressable TV campaigns deliver a strategic advantage to brands who include this technology in their media plans.

Want to know more?
We'd love to tell you.

FINECAST

Key findings

- Addressable ads produce greater brain activity in four key networks relating to:

Attention

Emotion

Reward

Memory

- Addressable ads are recalled faster and more easily than non-addressable ads
- Addressable ads are recalled better in any context, i.e., whether participants choose the show or not
- Factors such as age and choice of content impact strength of recall

The experiments

To investigate how the brain responds to addressable ads, we carried out two experiments. The first took place in the UCL lab with 24 participants who had their brain activity recorded by fMRI while watching TV shows with ads that were either related to their interests (addressable) or not. This first experiment studied what (if any) cognitive and neurological mechanisms were activated by addressable content.

The second experiment was conducted with 200 pre-screened participants online. These participants were shown the same content as in the first experiment, then their memory and recall for addressable content was measured using an online behavioural survey. This second experiment was designed to measure what impact addressable TV ads have on participants' memory and recall of relevant (addressable) ads vs. non-relevant ads.

Experiment One:

Brain response to addressable vs. non-addressable ads

The first experiment looked at what impact addressable ads have on brain activity. Previous research has demonstrated that people both prefer and remember addressable ads more than non-addressable ads (TITB, Phases 1-3), and in this experiment we sought to establish what (if any) effect addressable ads have on neurological activity in mechanisms specifically related to attention, emotion, reward and memory.

To accomplish this, an in-person experiment was conducted at UCL using an fMRI machine to scan participants' brains. This study looked at what happens in key brain regions while a person watches TV and is exposed to addressable and non-addressable ads. We looked at four strategic areas associated with:

Attention — People don't remember ads that they don't pay attention to

Emotion — Ads that evoke emotions tend to be more readily remembered

Reward — When reward centres of the brain are activated, people feel good and associate that good feeling with your brand

Memory — For an ad to be effective it must be memorable

Participants:

To select participants, a pre-screening survey was sent to 304 people in the London area that asked about their interest in a variety of items including the four ad categories that would be part of the experiment (auto, travel, pets, and gaming). Responses were statistically analysed to account for response bias and to find participants with interest in two, and only two, of the ad categories featured in the experiment. This resulted in 102 potential participants who fell into one of the six categories below (Figure 1.)

Auto	Travel	Pets	Gaming
✓	✓	x	x
✓	x	✓	x
✓	x	x	✓
x	✓	✓	x
x	✓	x	✓
x	x	✓	✓

Figure 1: Participant profiles showing the two, and only two, categories of ads a selected participant expressed interest in

Twenty-four people took part in the experiment. There were exactly four volunteers from each of the six participant profiles, ensuring perfect balance across ad-relevance profiles. The demographics of the group were as follows:

Age Range	Male	Female
18-34	**4**	**4**
35-54	**7**	**6**
55+	**0**	**3**

The experiment

Participants in the experiment made two, one-hour visits to the Birkbeck-UCL Centre for Neuroimaging approximately seven days apart. Each visit consisted of two shorter (7-minute) fMRI screenings followed by a longer, 30-minute scan. The short scans were designed to localise brain activity associated with attention, emotion, reward, and memory, whereas the main experiment measured brain activity in each of these four networks while participants watched a 30-minute TV episode with embedded ads (addressable and non-addressable).

To enhance the reliability of the results, conditions at each of the two participant visits were varied. During the first visit, half of the participants chose the show they watched, while for the other half, the show was randomly selected by a computer; on the second visit, the conditions were reversed. This allowed researchers to compare how participants responded to addressable and non-addressable ads under both conditions (self-selected vs. other-selected).

At the end of the second scanning session, all participants received a five-minute structural scan to identify their underlying brain anatomy, and all were found to be neurologically normal adults.

Results

Addressable ads showed an advantage over non-addressable ads in all four brain networks relating to: attention, emotion, reward and memory. This is consistent with previous research (TITB, Phases 1-3) and suggests that multiple brain systems contribute to the addressability uplift effect.

Interestingly, addressable ads provoked a stronger response than non-addressable ads regardless of whether the participant chose the TV show or not. This is encouraging because it suggests that addressable ads are effective whether you're the person holding the remote or not.

Attention

During the experiment, activity in the brain's visual attention network (shown in blue, Figure 2) increased slightly during all ads **relative** to the TV show. More significantly, however, the scans showed markedly greater attention-related activity for addressable ads vs. non-addressable ads, which indicates that the more relevant an ad is to the viewer, the more attention they give to it.

Visual attention network

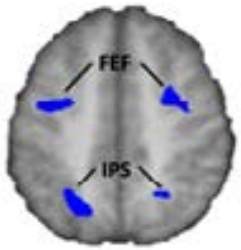


Figure 2: Visual attention network made up of the frontal eye lids (FEF) and intra-parietal sulci (IPS)

Attention for ads relative to show

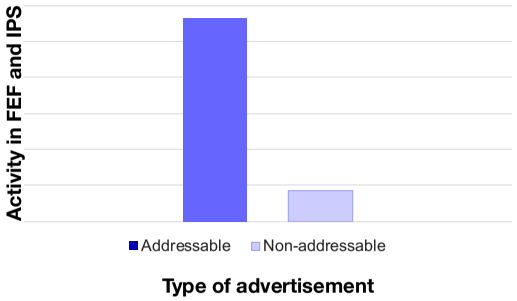


Figure 3: Graph showing attention (as indicated by activity in the visual attention network) given to ads vs. TV show

* There are no numbers on the fMRI plots because the data is represented as differences in statistical distributions – what matters is the relation between the numbers. fMRI measures changes in blood oxygen levels (which we call BOLD signal) which vary enormously from person to person and even session to session. As a result, instead we measure relative changes. In this experiment, for instance, we measured the BOLD signal from addressable ads, non-addressable ads, and from the TV show they were watching.

Emotion

This experiment measured emotion-related brain activity in the amygdala (Figure 5). When comparing activity in this region during ads (both addressable and non-addressable) vs. the TV show, there was more activity in the amygdala during the TV show (as indicated by the downward direction of the bars in Figure 6). This is unsurprising given that the longer narrative form of the TV show facilitates greater emotional engagement than the shorter ads.

Figure 5: Amygdala, integrative centre of emotions

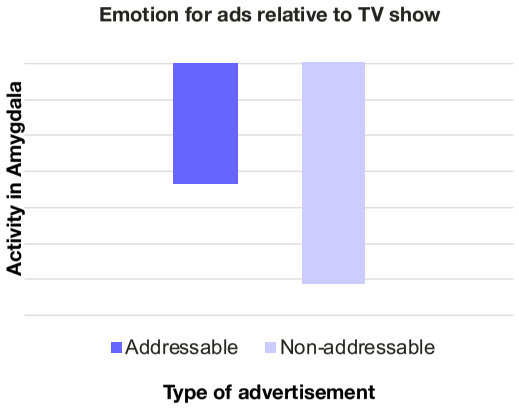


Figure 6: Chart showing emotional response to addressable vs. non-addressable ads

However, when comparing activity in the amygdala during addressable vs. non-addressable ads, the uplift in activity was greater during addressable ads, with brain activity being closer to levels observed during the TV shows (as indicated by the shorter/less substantial drop-off in emotional response during an addressable ad in Figure 6 above).

Reward

As you'll see in Figure 8, all ads (both addressable and non-addressable) produced less brain activity relative to watching a TV show within the area of the brain associated with rewards; the ventral striatum (image in Figure 7). Overall, ads were less rewarding than the TV show (indicated by the downward direction of the bars), which is to be expected. Even so, there was a clear advantage for addressable ads vs. non-addressable. Notice how, in Figure 8, the downward direction of the addressable bar is noticeably shorter, indicating smaller reduction in reward activity (vs. the TV show) during an addressable ad and a more substantial drop in activity during a non-addressable ad. This demonstrates that addressable ads are more rewarding to the viewer than non-addressable.

Figure 7: Ventral striatum: active during reward-related activity

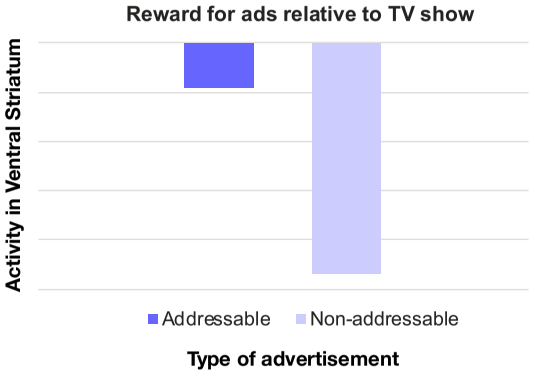


Figure 8: Chart indicating activity in ventral striatum during addressable and non-addressable ads relative to TV show

Memory

The final analysis in this experiment looked at brain activity associated with making memories, as indicated by activity in the hippocampus (Figure 10). This study found that, in terms of memory-related activity, there is a clear advantage of addressable ads over non-addressable ads. Figure 11 shows a minimal drop in memory-related activity relative to TV show levels during addressable ads and a substantial drop in memory-related activity during non-addressable ads.

Figure 10: Hippocampus: area of the brain which plays a major role in learning and memory

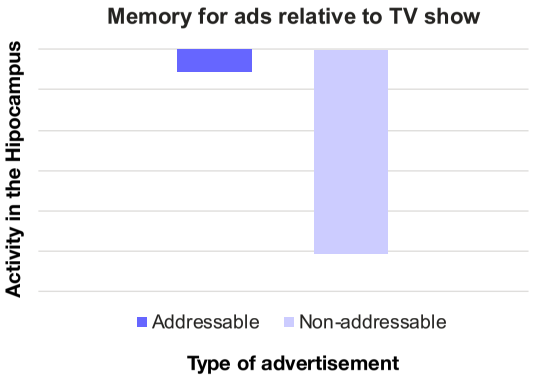


Figure 11: Chart showing a minimal drop in memory during addressable ads vs. a substantial drop in memory during non-addressable ads

Experiment Two:
Behavioural testing of addressable content: memory and recall

Through the cognitive element of this experiment, we learned that key areas of the brain were more activated by addressable ads than by non-addressable ads. This is fascinating, so we wanted to delve a little deeper and determine if these observed brain activations would lead to measurable increases in memory and recall for addressable content. Previous phases of our research (TITB, Phases 1-3) demonstrated statistically significant increases in memory and recall for addressable ads. In this experiment, we sought to replicate these results with a larger sample of new participants, and a different set of ads to further ensure the validity and robustness of the original study (Open Science Collaboration, 2015).

Participants

An initial pre-screening survey was sent out to 1,000 UK-based participants, the results of which led to 340 suitable candidates who fit into one of the six profiles previously referred to in Experiment One (Figure 1). We then selected a subset of 200 participants such that each profile had an equal number of participants, and that each profile had an equal number of female and male participants. The demographic data was as follows:

Figure 1

100 Female **100** Male

40%
Aged 18 – 34

45%
Aged 35 – 54

15%
Aged 55 – 70

The experiment

Once screened for suitability, participants were randomly assigned into either the choice condition (where they chose which TV show to watch during the study) or the random condition (in which the TV show was randomly selected for them). Participants then watched four ads (one from each of our four selected categories: auto, travel, pets, and gaming), followed by six minutes of the TV show. This cycle was repeated four times so that participants viewed a total of 16 ads, four from each of the four categories. These ads were presented in fully randomised order.

After viewing, participants were shown an image and asked to identify, as quickly as possible, whether they had seen it in one of the ads. Half of the images they were shown were from the ads in the study, while the other half were not. Participants were also asked to rate how much they liked each of the ads.

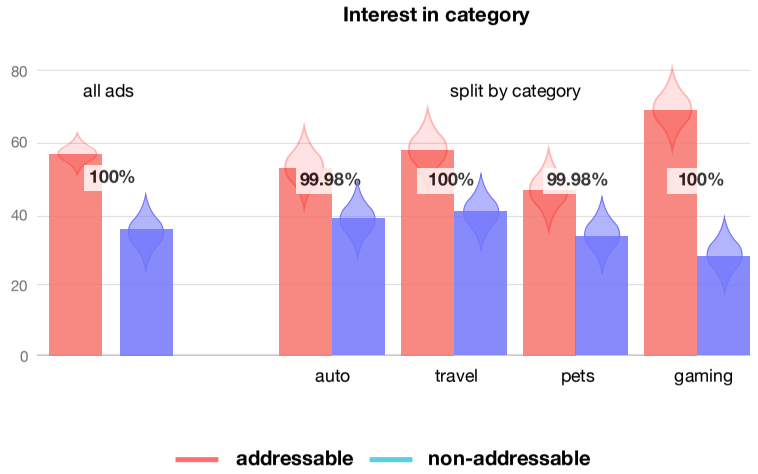


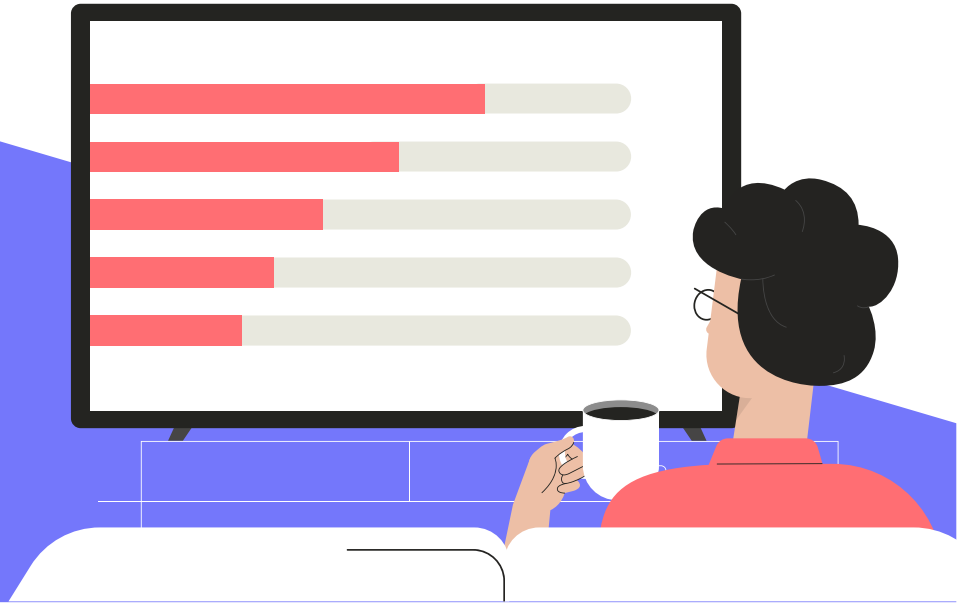
Figure 12: A chart demonstrating the difference in participant interest in each of the four ad categories. The bars represent the average interest level of participants based on whether the category was addressable for them (pink) or not (green). The percentages represent the degree to which we can be confident that there are differences between the two conditions (addressable and non-addressable). A score above 90% represents strong evidence for a difference between conditions.

The top border of each box runs through the mean score of each category, and the width of the violin graphic demonstrates the distribution of responses, wider equals more responses.

Results

Checking accuracy of participant recruitment

First, we conducted a manipulation check to confirm that our pre-screen survey correctly recruited people according to their interests. The results of this check (including Bayesian mixed models on these and all behavioural results) indicated that there were strong differences in the addressable and non-addressable conditions (Figure 12).



Explicit likability of addressable vs. non-addressable ads

Once we had the above evidence that confirmed our participants were split into accurate conditions, we could move ahead with showing ads and measuring their responses based on whether an ad was addressable for them or not. Our next measurement showed that, overall, participants reported liking addressable ads much more than non-addressable ads across all categories (Figure 13).

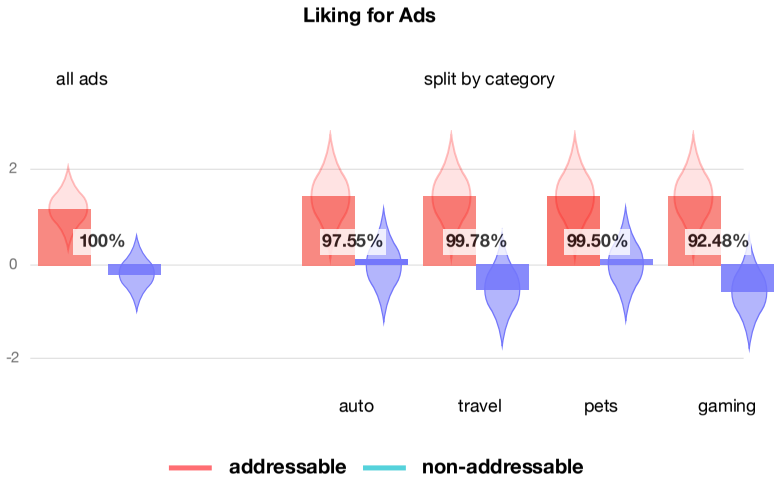


Figure 13: Chart showing the degree to which participants liked ads that were addressable (pink) and non-addressable (blue). A "0" rating represents the average liking score that participants gave to all ads.

The percentages, as in Figure 12, represent the degree of accuracy, while the pink and blue boxes within each violin graphic show the degree to which an ad was liked or disliked. The results for "All ads" on the far left, for example, shows a 1-point increase in liking for addressable ads overall, a decrease in liking for non-addressable ads (the downward direction of the box moving below 0) and a 100% confidence rating in the accuracy of the difference between the two conditions.

Implicit measurements

So far, the explicit judgements of the participants were in line with that which we could predict for addressable ads, but what about their implicit cognition and behaviour? To measure this, we (1.) analysed the accuracy and speed of participants' memory (2.) tested whether speed and accuracy changed when an ad was addressable for each participant, (3.) whether speed and/or accuracy changed depending on the ad category, and (4.) whether the effects changed according to TV context (chosen or randomly assigned TV show).

Accuracy in recalling addressable vs. non-addressable ads

Participants' ability to correctly remember ads was roughly 10% higher for addressable content than for non-addressable content (Figure 14). This was calculated using a measure of accuracy called d-prime which considers participants' accuracy in rejecting stills and logos from ads they were not shown and in recognising stills and logos from ads they were shown. The results also showed that participants' correct recall for addressable content was 1.7% faster. This demonstrates participants were encoding addressable ads into their long-term memory more effectively, therefore reacting faster and more confidently to the content.

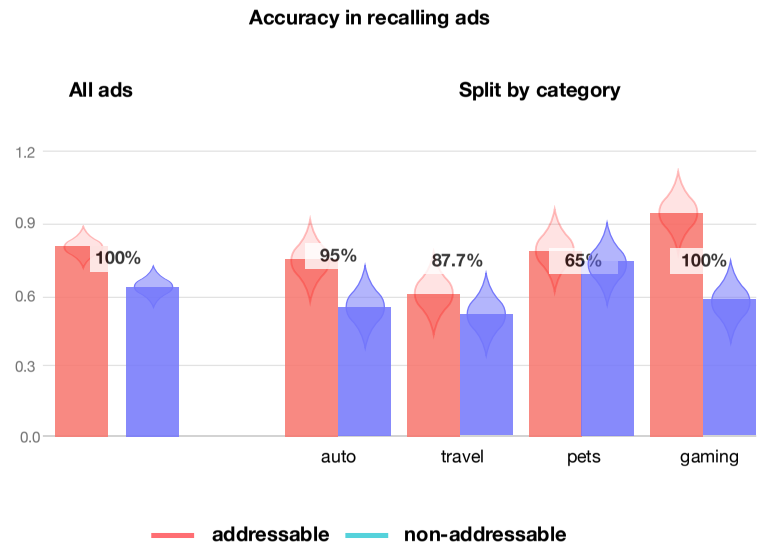


Figure 14: Chart showing accuracy in recalling ads

Memory accuracy for ads, based on context and age, when choosing own show

We further investigated the results reported above by interrogating the effects of context and age. First, we looked at what happens when participants chose the TV show for themselves. In this case, participants of all ages generally remember addressable content better, (Figure 15), as illustrated by the higher addressable line on the graph.

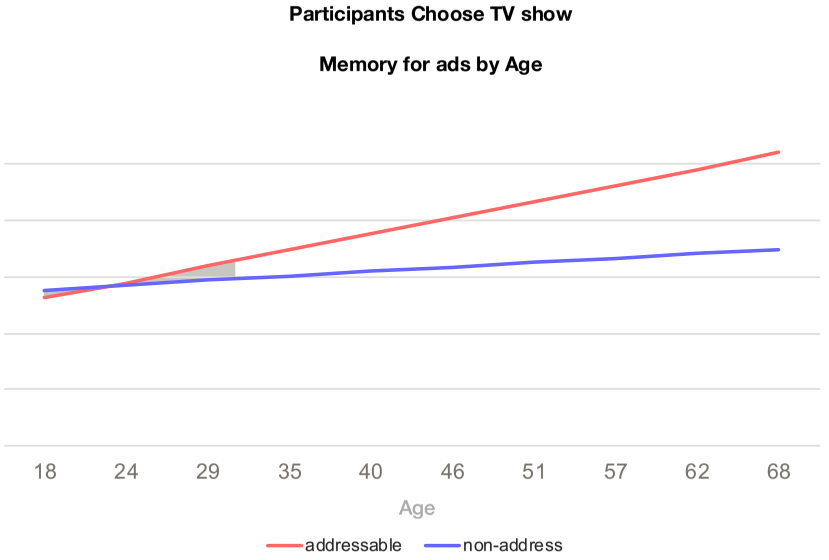
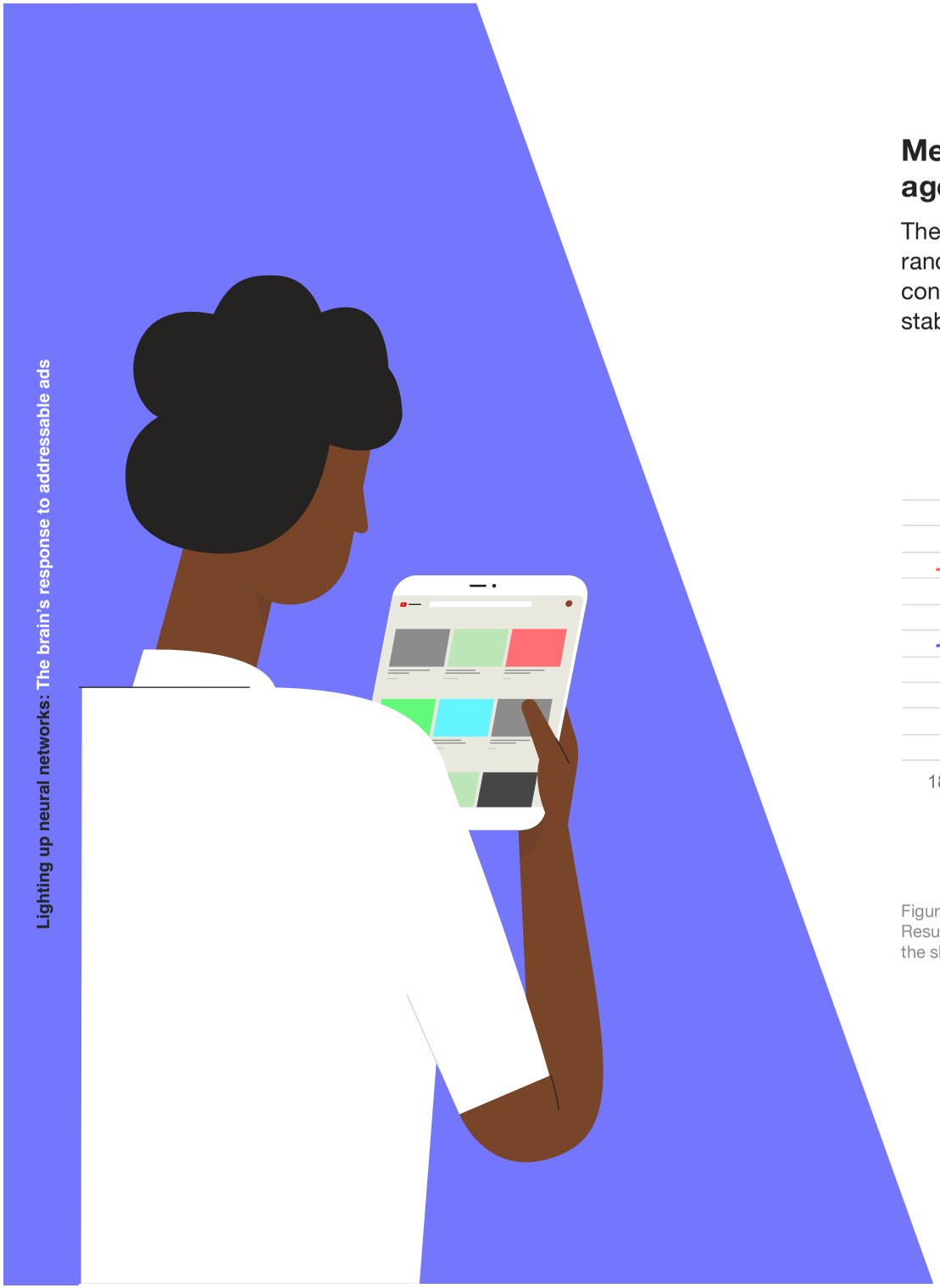


Figure 15: Chart showing addressable content is remembered better by all participants (red line), and that this increase in the effects of addressability increased amongst older participants. Regions shaded in grey indicate ages where there was no statistically significant evidence that addressable content was remembered better than non-addressable content when choosing their own show. This is an interesting finding to investigate in a future study with a larger sample size.



Memory accuracy for ads, based on context and age, when show is randomly selected

The results demonstrated that when participants were shown a randomly selected TV show, memory for addressable content is consistently better than for non-addressable content and is relatively stable across all ages (Figure 16).

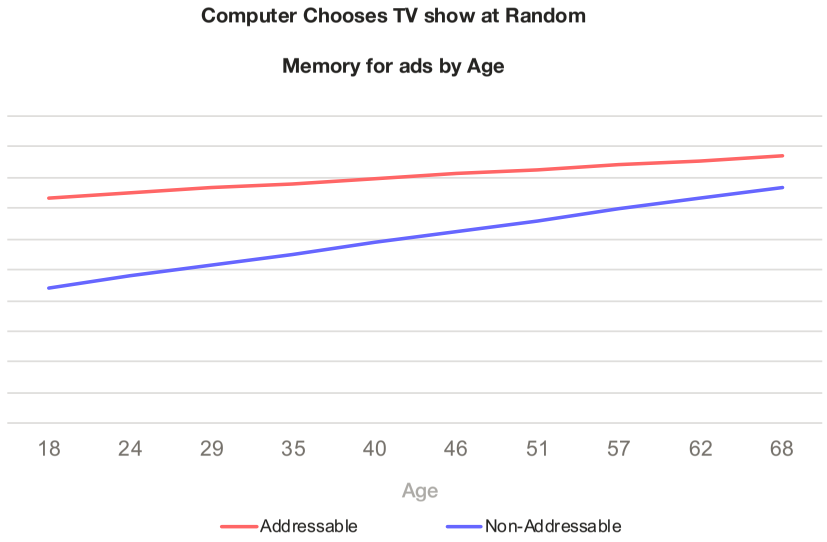


Figure 16: Chart showing addressable ads remembered better by participants of all ages. Results also showed that memory for non-addressable ads improved as people aged when the show was randomly selected.

Conclusion

Like our previous studies (TITB, Phases 1-3), the results of this research reveal compelling insights into the effectiveness of addressable TV. The data collected in this study reveal that addressable ads:

- Garner greater attention from viewers
- Are more emotionally engaging
- Elicit more reward activity in the brain
- Are encoded into memory more effectively

FINECAST

Why does this matters for advertisers?

In the world of media and advertising, brands are competing for a limited and extremely valuable resource: attention.

With an infinite number of channels to choose from, it's important to know what advertising medium provides the greatest return on investment because, like customers' mental bandwidth, advertising budgets are finite. Allocating your clients' budgets effectively and strategically is of paramount importance, and it's equally important to know that when you invest in addressable TV, you're not hoping it's a smart investment, you can be confident it is because there's convincing data to back it up.

This means that when you run addressable TV campaigns, you can rest assured that not only will the planning and targeting capabilities help you define and reach your desired audience, but also that once the creative is in front of your ideal customer, it will have the greatest possible impact.

Time and again, TV has been rated as the most trusted advertising medium, and research continually demonstrates that addressable ads draw more attention and are more memorable than non-addressable ads. It's no wonder, then, that advertisers consistently achieve uplifts across the full funnel including increases in sales from existing and new customers, store footfall, website traffic, and brand uplift metrics such as awareness, purchase intent, consideration, and recommendation, not to mention cost-effective incremental reach above and beyond traditional linear TV advertising.

Finecast provides advertisers a single point of access to the addressable TV ecosystem so they can reach their target audiences on the right screen, at the right time, with the right message, providing the optimal environment for driving positive results.

If you haven't invested in addressable TV with Finecast yet, what are you waiting for? Make 2023 the year your brand gets on TV.

Thank You

To review previous research and keep updated with future projects, please visit www.finecast.com

FINECAST