

# Neuromarketing

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# Presentation Agenda

- Overview
- History
- Methodology
  - Recording Metabolic Activity
  - Recording Electric Activity
  - Without Recording Brain Activity
- Case Studies
  - Limitations of Case Studies
- Review/Questions
- Implications of Neuromarketing
- Discussion - Morality



# Introduction

## Coke and Pepsi Activity



# Overview - What is Neuromarketing?

- Marketing: How do we effectively sell a product?
  - \$400 Billion annually invested in advertising.
  - How do we assess the effectiveness of our marketing campaigns?



# Poor Commercial



# Good Commercial



# What is Neuromarketing?

- Neuromarketing is an emerging field that connects consumer behavior with cognitive science.
  - How can we apply what we know about the way our brains operate to marketing?



# What is Neuromarketing?

- Due to its youth as a field, there are still several questions that need answers.
  - Ex. Business Practice or Academic Field?
- Neuromarketing employs several different techniques in order to assess the effectiveness of marketing schemes.





# History of Neuromarketing

- June 2002: First usage of the term “Neuromarketing” when BrightHouse announced fMRI use for business division.
  - BrightHouse and SalesBrain offered Neuromarketing consulting services and research.



# History of Neuromarketing

- 2003: Read Montague of Baylor College of Medicine performs the first scholarly piece of neuromarketing research.
  - Coke vs. Pepsi Study using fMRI



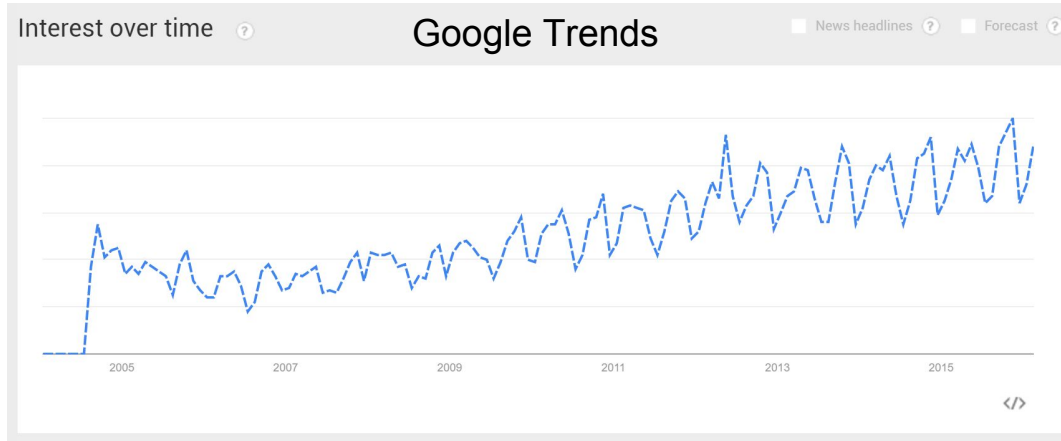
# Montague's Coke vs. Pepsi Study

- Performed experiment with fMRI
- When people are aware that they are drinking Coca Cola:
  - People say they prefer Coke over Pepsi
  - The brain regions of the EF (executive function) activate.
- When people are blind to which drink they are consuming:
  - People say they prefer Pepsi over Coke.
  - An structure in the limbic system responsible for our emotional and instinctual behavior activates.



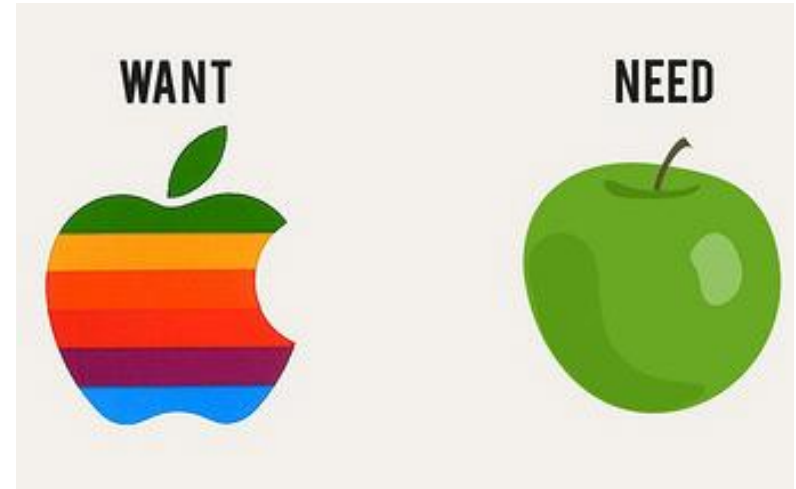
# History of Neuromarketing

- 2004: “Brain Scam” - questioning the ethics of neuromarketing
- 2005: Harper Collins adds “neuromarketing” to its dictionary.
- 2006: Neuromarketing starts to take off.



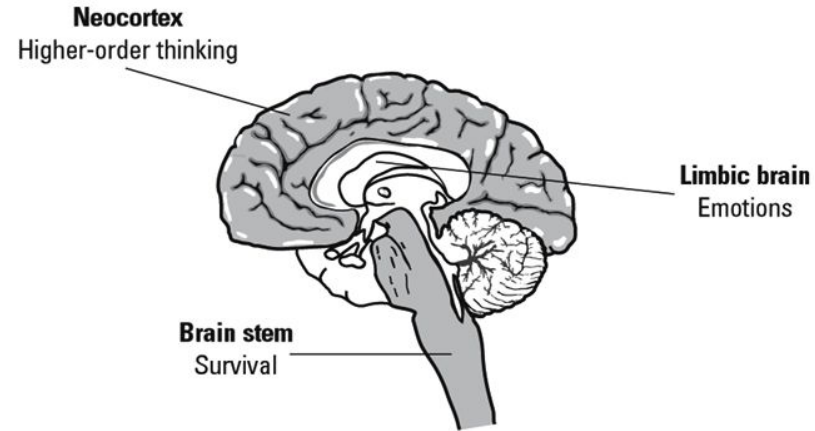
# The Basic Concept

- People don't always know what they want. Neuromarketing figures out how to *tell* people what they want.
- Conscious thought and decision making is not always accurate.
- Neuromarketers employ techniques to study the subcortical regions of our brains to figure out what we *do* want.



# Neuromarketing & The Brain

- There are three major areas of the brain:
  - Neocortex (The New Brain)
    - Rational, Conscious
    - System 2
  - The Middle Brain
    - Emotional
  - R-Complex - Reptilian Brain
    - Instinctual
    - System 1



# The Crux: The Reptilian Brain

- Has developed for millions of years.
- Only 20% of our brain energy usage is conscious.
  - 80% energy is used to sustain rest state (default mode)
- The main goal of the R-complex: **Survival**



# The Crux: The Reptilian Brain

- Characteristics
  - Pre-verbal
  - Ignorant to complex messages
  - Pain Avoidance > Pleasure Seeking
  - Can process visual information without using the visual cortex.

"The aim of the wise is  
not to secure pleasure,  
but to avoid pain."

- Aristotle

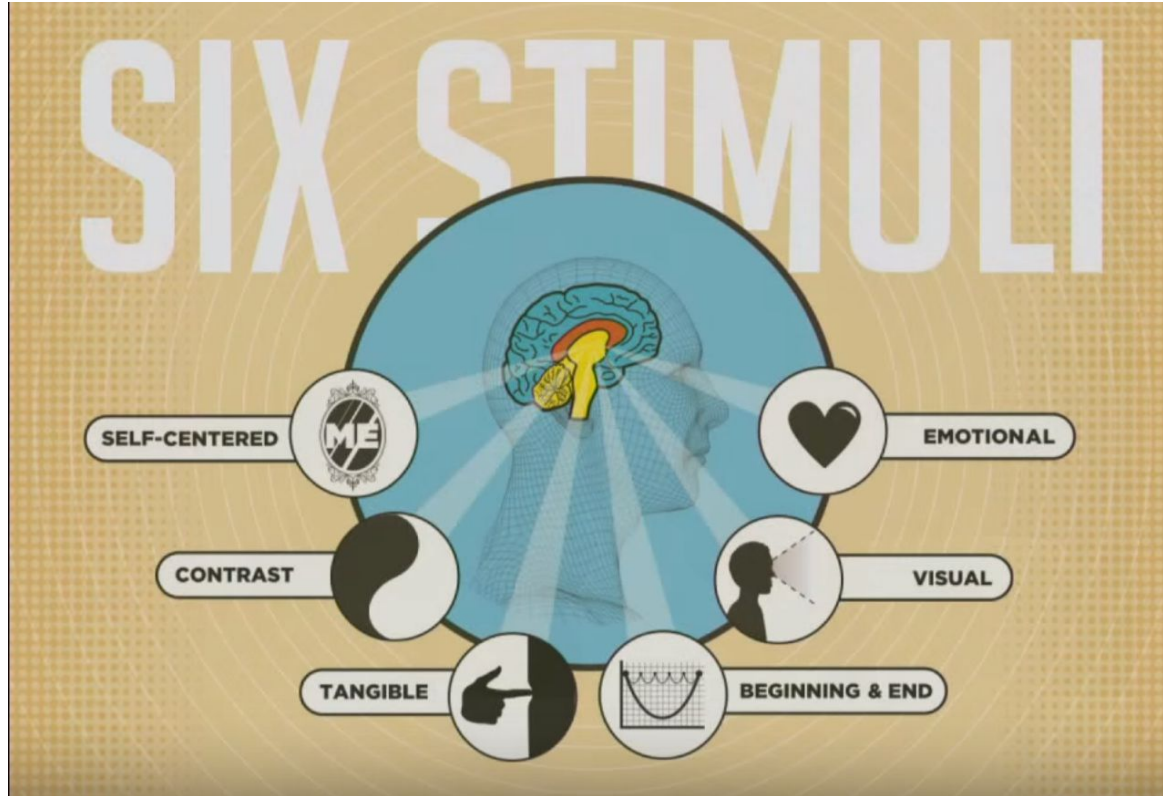


# The Crux: The Reptilian Brain

- The human brain is wired to prioritize instinctual responses.
- The R-complex generally has a greater influence in decision making than the other parts of the brain.
- To be effective, Neuromarketers try to understand what stimulates the Reptilian Brain



# Stimulating the Reptilian Brain



Tip of the hat  
to you,  
Patrick  
Renvoise



# Stimulating the Reptilian Brain

- 6 Principle Stimuli
  - **Self-Centered**
    - Framing advertisements around “you.”
  - **Contrast**
    - People can easily understand contrasts.
  - **Tangible**
    - Make value proposition very easy to understand.
  - **Beginning and End**
    - The beginning and end are the most important.
  - **Visual**
    - Optic Nerve is 50 times faster than the auditory nerve.
  - **Emotion**
    - Appeal to the emotional reaction of humans.



# Reptilian Stimuli Examples

Visual



Contrast



Tangible

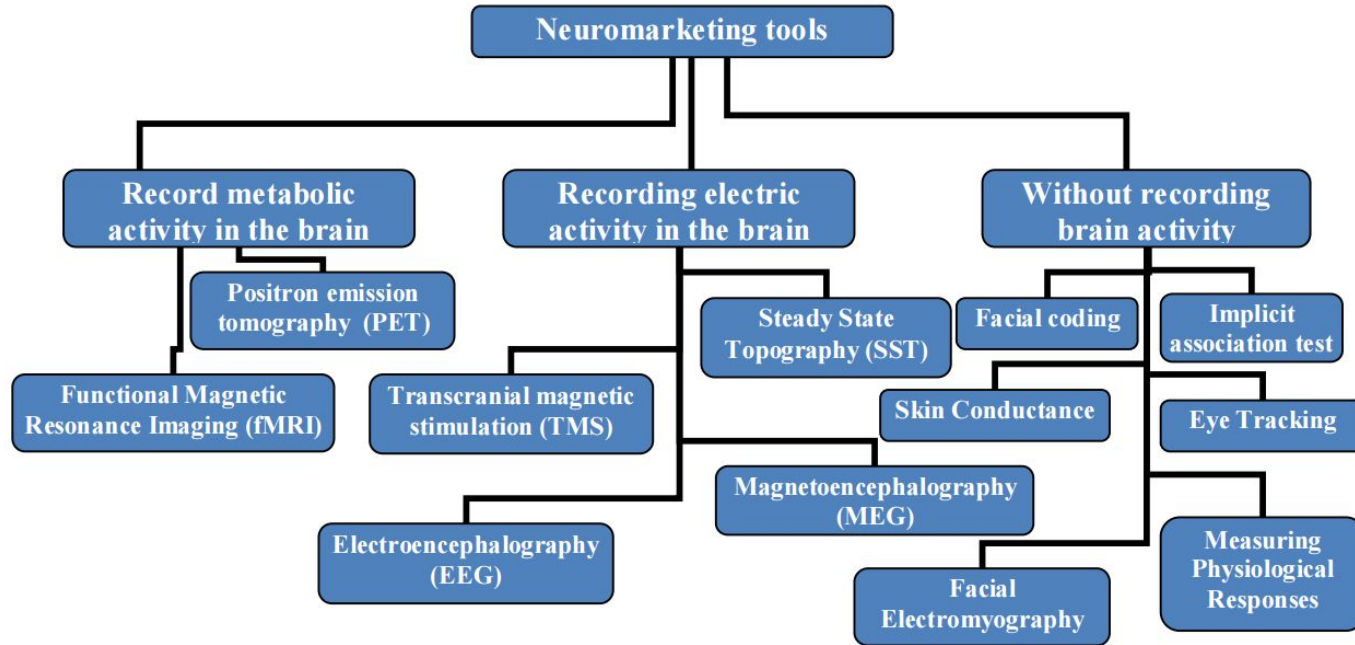


# Neuromarketing vs. Consumer Behavior

- An important distinction to make:
  - consumer behavior, or consumer psychology, has been an active field for decades
  - neuromarketing is relatively new and seeks to answer many of the same questions with a defined set of tools
- Questions: What goes on in our brain when we are exposed to marketing, when we decide to buy things?
- Tools: A physiologically-driven neuroscience approach to research
  - electrical activity in the brain
  - metabolic activity in the brain
  - other physiological markers
    - facial coding, galvanic skin response, eye tracking



# How do we study neuromarketing?



# Recording Metabolic Activity of the Brain

*functional* Magnetic Resonance Imaging (fMRI)

## MEASURES

memory encoding | sensory perception | valence of emotions |  
craving | trust | brand loyalty | brand preference | brand recall

## ADVANTAGES

**spatial resolution** |  
interpretation of psychological  
processes | localization of neural  
processing | advanced software |  
non-invasive

## DISADVANTAGES

**temporal resolution** |  
non-scalable | static recordings |  
complex data analysis | ethics  
price



# Recording Metabolic Activity of the Brain

*functional* Magnetic Resonance Imaging (fMRI)

## WHAT IS IT USED FOR?

new products/campaigns | advertisements | packaging design |  
pricing | repositioning a brand | predicting choices | identifying needs





# Recording Metabolic Activity of the Brain

## Positron emission tomography (PET)

Involves administration of radioactive substance to receive spatial resolution similar to that of fMRI

What is it used for? new products | advertisements | packaging



# Recording Electric Activity in the Brain

## Electroencephalography (EEG)

### MEASURES

attention | engagement | excitement | emotional valence | cognition | memory encoding | recognition | approach and withdrawal

### ADVANTAGES

simplicity | temporal resolution | comparisons between the hemispheres of the brain | correlation between EEG asymmetry and personality traits | costs | straight-forward data analysis | non-invasive | cognitive information processing measurement

### DISADVANTAGES

variation between person to person causes difficulty | spatial resolution | non-scalable | high complexity | emotion differentiation limited to positive vs. negative | results influenced by experimental setting

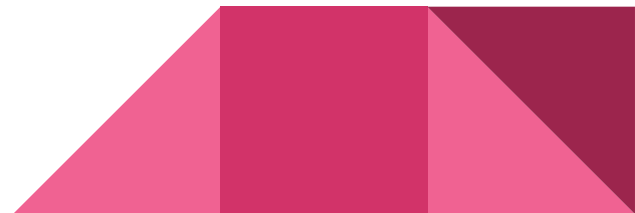


# Recording Electrical Activity of the Brain

Electroencephalography (EEG)

## WHAT IS IT USED FOR?

advertisements | new campaigns | movie trailers | video material |  
website design and usability | in-store experience | taglines



# Recording Electrical Activity in the Brain

- Magnetoencephalography (MEG)
  - records brain activity using magnetic potentials
  - new products | advertisements | packaging | identifying needs | sensory testing
- Transcranial magnetic stimulation (TMS)
  - uses magnetic induction to modulate the activity of certain brain areas
  - new products | advertisements | packaging design | marketing stimuli
- Steady State Topography (SST)
  - used to observe rapid changes and measure brain activity
  - advertisements | movie trailers | prints | brand communication



# Without Recording Brain Activity

## Eye Tracking

### MEASURES

visual fixation | search | eye movement patterns | spatial resolution | excitement | attention | pupil dilation

### ADVANTAGES

pupil dilation and blink rate are accurate indicators of involvement and excitement | portable | spatial attention | non-invasive

### DISADVANTAGES

high cost | reliability | dependent on participants' eye conditions



# Without Recording Brain Activity

## Eye Tracking

### WHAT IS IT USED FOR?

usability research | in - store reactions | packaging design | advertisement | prints and images design | how consumers filter information | hierarchy of perception | shelf layout | product placement



# Without Recording Brain Activity

- Skin Conductance
  - Measure subtle changes in GSR when the autonomic nervous system is activated
  - Predicting market performance
- Facial Coding
  - Measure micro-expressions that code non-conscious reactions
  - Advertisements | movie trailers
- Facial Electromyography
  - Measure and evaluation the physiological properties of facial muscles to reflect conscious and unconscious expressions of emotions
  - Consumer reactions | video materials | brand recall



# Without Recording Brain Activity

- Measuring Physiological Responses
  - Measuring heart rate, blood pressure, skin conductivity, facial muscle contractions and stress hormones in saliva infer emotional states
  - Advertisements | movie trailers | web design | in-store reactions | consumer behavior
- Implicit Association Test
  - Use comparisons to identify hierarchies of products
  - Celebrity endorsement | brand positioning | salient packaging features





# Neuromarketing and Brand Recognition



# Brand Recognition: Prior Research

Deppe et al (2005): Used fMRI to examine people's brains while making purchase decisions

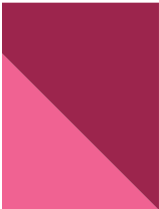
- Process of selection was associated with a “winner takes all” effect for the winning brand due to reduced cognitive activity and increased activity at sites mediating emotional processes

Schaefer et al (2006)

- Asked participants to imagine themselves driving cars of various brands.
- Recognized brands yielded more activity in the medial prefrontal cortex (decision making)

Knutson et al (2007)

- Excessive pricing activates the insular cortex, a region thought to be associated with pain anticipation and disgust



# Brand Recognition: Implicit Long Term Memory

- In practice, the influence of brand exposure to purchase decision-making must rely on long term memory
- Traditional market research measures of recognition and recall don't suffice
  - A growing body of neuromarketing research suggests that unconscious and implicit memories have a significant influence on consumer attitude and behavior (North et al. 1999, Fitzsimons et al, 2002)



# Brand Recognition: Methodology

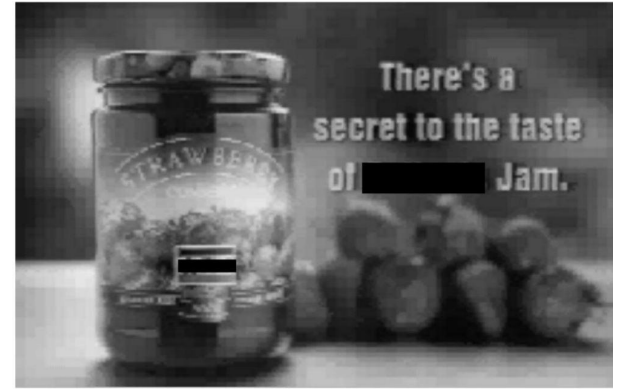
- Steady State Topography (SST) and EEG based
- 198 females ages 25-45 in Melbourne
- asked to select six food products of various categories from a range of display cases, with each category containing three equally priced options
- 20 minute video, two short ad breaks each containing four ads. One ad (45s) was for a brand of jam that was on display
- Rated the video narrator as a mask then proceeded to choose another six products roughly 25-30 minutes after viewing the target ad
- Tested the statistical significance of SST differences between participants who shifted to the target brand and those who did not

# Brand Recognition: Hypothesis and Results

**Hypothesis:** Lateral prefrontal activity (associated with Long Term Memory encoding) would be higher for the group of participants who shifted to the advertised brand than for those who did not

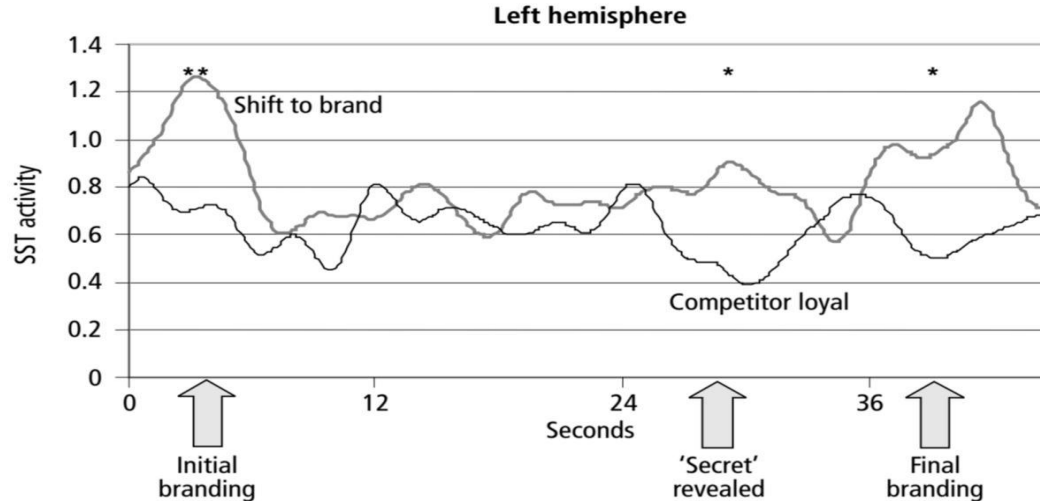
**Results:** 18 participants shifted to target brand, 8 shifted away, 111 did not shift at all.

SST activity in the *left* lateral prefrontal site was significantly larger during the moments of target brand exposure for the shift-to group compared to the no-change group



# Brand Recognition: Key Results

**Figure 4: SST activity at left lateral prefrontal site for the group that shifted to the advertised brand (tinted line) and the group that was competitor loyal (black line); the heavy arrows indicate the points in time corresponding to initial branding, the revelation of the 'secret' and final branding**



**Notes:**

1. The unit of SST activity is expressed in radian units. In the current study, SST activity of  $2\pi$  radians corresponds to a latency difference of 77 msec.
2. Asterisks indicate the following permutation test probabilities associated with the SST activity difference between the group that shifted preference to the advertised brand and the competitor-loyal group.  $**P < 2\%$ ;  $*P < 5\%$ .

# Neuromarketing and Music Popularity



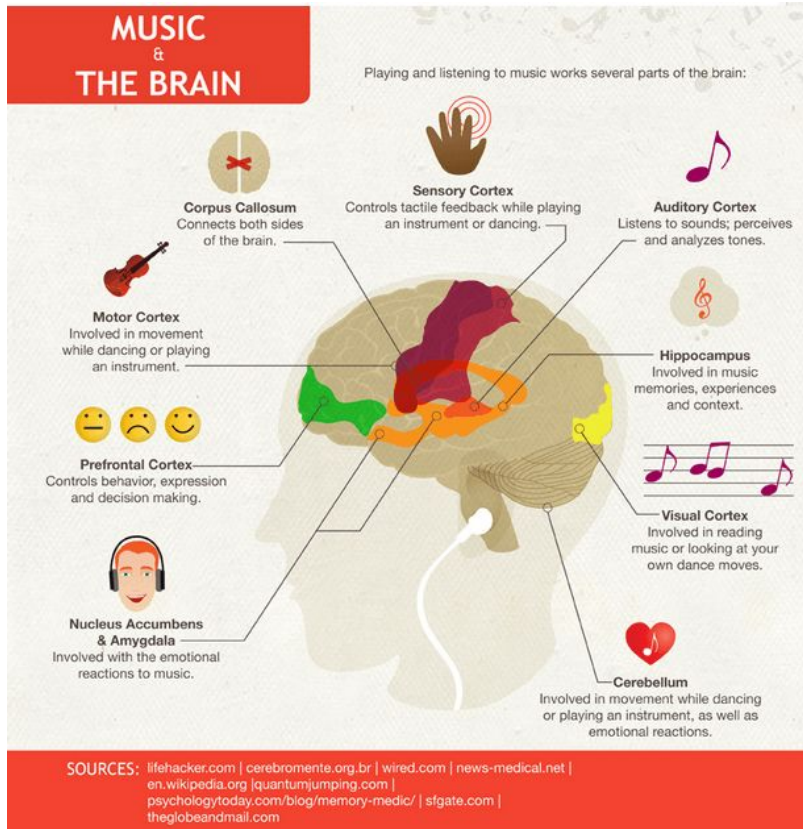
# Whoops... Wrong Music

- Educational entertainment called... Brain-Hop
  - Revealed by NeuroFocus at the SXSW Music Festival in 2010
  - NeuroFocus, now Nielsen's Consumer Neuroscience division, is the world's leading neuromarketing company
- 
- It probably didn't take neuromarketing to know that this song wouldn't hit the Billboard 100 chart... but what if we could predict music popularity?





# Music and the Brain



- Music stimulates the brain in very broad and diverse ways.
- So how could we possibly predict such complex interactions?

Neuromarketing: When the Brain Sells.  
"Music & The Brain." Accessed February 20,  
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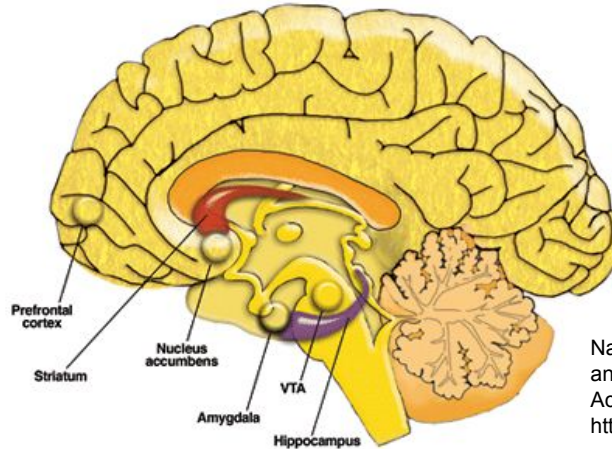
# Case Study: Music Popularity

- A Neural Predictor of Cultural Popularity - G.S. Berns & S.E. Moore, 2012
- Test prospect of using fMRI to predict cultural popularity of music.
- Measured brain activity of 32 adolescents while they were listening to 15 second clips from 60 songs of their three favorite genres.
- Asked participants to rate songs for likability and familiarity.
- Song popularity was measured by tracking unit sales over three years.



# Case Study Results

- Likability correlated with activity in the cuneus, orbitofrontal cortex (OFC), and the ventral striatum/nucleus accumbens (NACC)
- Average activation in the NACC was a significant predictor of popularity
- Subjective ratings of likability and familiarity did not predict music popularity



National Institute on Alcohol Abuse and Alcoholism. "Brain Diagram." Accessed February 20, 2016. <http://tinyurl.com/hdypou7>

# Results Continued

- Particularly unpopular music was associated with low activation of the OFC and NACC, while popular songs were not associated with such a specific pattern.
- Activation in reward centers of the brain may not only predict personal purchases, but may actually indicate population purchasing trends.
- Apologize by OneRepublic was particularly successful at activating the brain as well as gaining market popularity.



# Case Study: Super Bowl Ads

**Goal:** Understand which ads result in the most emotional engagement and why that is the case

## Methods

- Heart rate, skin conductance, and facial coding of 80 participants while viewing the ads, fMRI scanned an additional 30 participants one week later to monitor brain activity and gain an “unbiased view”

## Results

- Ads that took consumers on “an emotional journey” delivered highest engagement
- Convergence: high biometric performance overlapped with activity in brain regions associated with emotion (amygdala), memory (hippocampus), and reward (lateral prefrontal cortex)



# Case Study: Super Bowl Ads

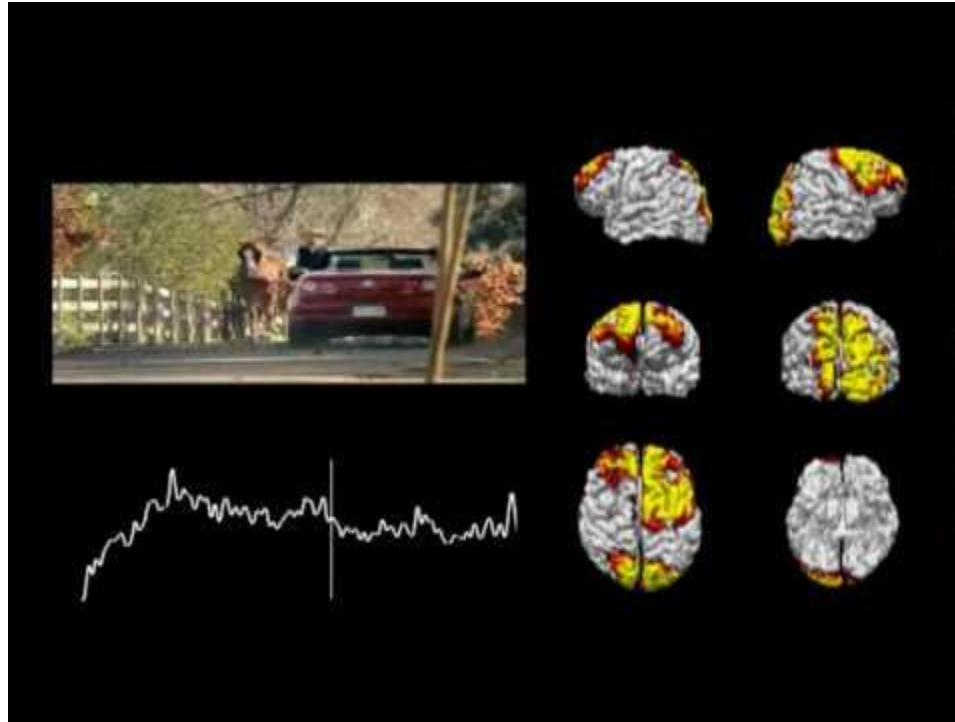


## Research's Super Bowl Ad Rankings Relation to Creative Arts Emmy Awards

- Sands Research Inc., a pioneer in using neuromarketing to test television advertisements' responses, extensively studied (via EEG) 72 Super Bowl television ads in 2009
- Three out of Sands' top five commercials were nominated for the Academy of Television Arts and Sciences' Creative Arts Emmy Award, and Sands' highest ranked one Coca-Cola's "Heist" won
- The commercial's ability to captivate the participants throughout its entirety corresponded with strong and sustained brain responses

# Case Study: Super Bowl Ads

Video of the “best engaging” Super Bowl ad of 2010



# Quick Case Study: Starbucks Pricing

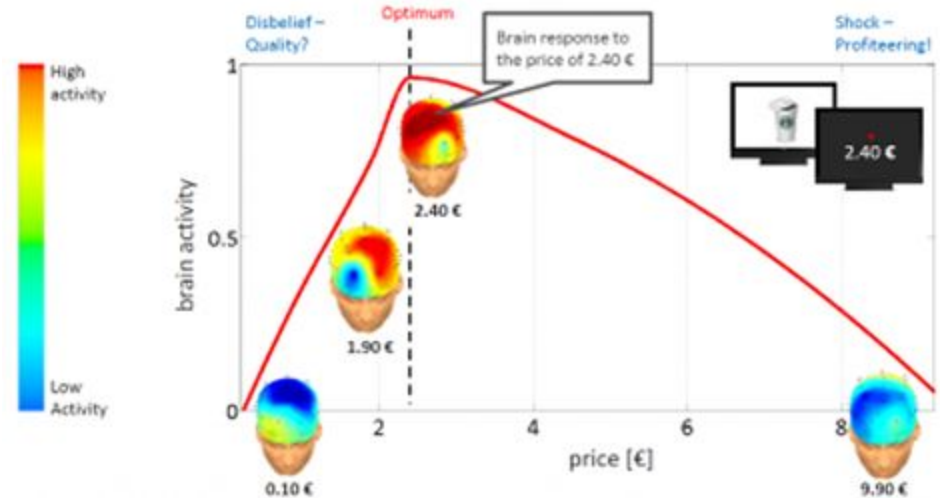
- A university study used EEG to measure how much money participants are willing to pay for a small cup of Starbucks coffee
- Participants were shown prices on a screen and then asked whether they think they are cheap or expensive
- Brain responses were measured for different prices





# Quick Case Study: Starbucks Pricing

- The strongest brain response occurred when the price was most reasonable
- When the price was unexpected, activity corresponding to that of doubt, surprise, and confusion was shown



# Quick Case Study: Emotional Impact of Scent

**Goal:** Procter & Gamble was launching new single dose pods of Gain detergent and wanted to prove that people's emotional connection to their brand's signature scent was comparable to other "emotionally significant experiences" in customer's lives

## Methods:

- Used biometrics and facial coding to compare participant's reactions to Gain detergent versus other, similar scents as well as to music from their favorite genre

## Results:

- "participants experienced the Gain scents on an emotional level greater than the experience of listening to one's favorite music"



# Quick Case Study: Cheetos and Lays

Frito-Lay's use of neuromarketing research has served as a good alternative to traditional focus groups

**Method:** EEG, undisclosed

## Results:

- Sticky residue left on fingers after eating cheetos elicits a strong and “sticky” neural response → “orange underground” ads
- Matte beige bags do not trigger the part of the brain associated with guilt, the anterior cingulate cortex



# Limitations

- Enjoyment or happiness may have different neurological indicators depending on culture. Two very different fMRI readings could indicate a very similar thing, or vice versa.
- It is important to evaluate a firm's research with a critical eye, and conclusions should not be overstated in such an early phase of research
  - Many of the promotional “case studies” that neuromarketing firms publish do detailed information about their research methodology
- Research is supposedly more about understanding the brain rather than controlling it. Do you think this is an accurate assessment?



# Concerns

- Are there privacy concerns?
- Are these concerns even new?
- Advertisers already know how to target the reward centers of the brain without brain imaging.
- Sex sells, and it has for ages.
- Have we already been unethically controlled by them?
- How do these new neuromarketing practices differ from standard advertising techniques?





Thank You!

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