

## The neural correlates of celebrity power on car favorability; fMRI study

Jong-Su Baeck<sup>1</sup>, Yang-Tae Kim<sup>2</sup>, Yeon Sung Jung<sup>3</sup>, Jeehye Seo<sup>1</sup>, Seong-Uk Jin<sup>1</sup>, Mun Han<sup>1</sup>, and Yongmin Chang<sup>1,4</sup>

<sup>1</sup>Department of Medical & Biological Engineering, Kyungpook National University, Daegu, Korea, <sup>2</sup>Department of Psychiatry, Keimyung University Dongsan Medical Center, Daegu, Daegu, Korea, <sup>3</sup>Department of Marketing, School of Business Administration, Dankook University, Gyeonggi, Korea, <sup>4</sup>Department of Radiology, College of Medicine, Kyungpook National University, Daegu, Korea

### Introduction

Preference judgments are influenced not only by product information but also by commercial advertising. The strong point of the advertising strategy using celebrity power is to imprint the products in minds of consumers quickly and to promote consumption psychology by attracting attention from them [1]. There are few studies investigating the neural correlates of celebrity power on advertising. Therefore, the aim of this study was to evaluate the neural networks of celebrity power on car advertising. To the best of our knowledge, this is the first study to examine the neural response to have an effect of celebrity on favorability toward the car.

### Methods

Using functional magnetic resonance imaging (fMRI), we measured favorability toward the car during confronting participants with a combination of a celebrity face and a car. As a control condition, we presented participants with a combination of an ordinary face and same car (Fig. 1). A 3.0 T GE Exite (Milwaukee, WI, USA) scanner equipped with a transmit – receive body coil and an eight-element head coil array was used to obtain blood oxygenation level dependent (BOLD) contrast for this neuromarketing experiment in 30 healthy participants. T2\*-weighted echo planar imaging was used for fMRI acquisition. The following acquisition parameters were used in the fMRI protocol: echo time (TE) = 40 ms, repetition time (TR) = 3000 ms, field of view (FOV) = 22 cm, acquisition matrix = 64 × 64. Using a midsagittal scout image, 24 contiguous axial slices with 4 mm thickness were placed along the anterior–posterior commissure (AC–PC) plane to cover the entire brain. Due to T1-saturation effects, the first three acquisitions were discarded. A 3-D T1-weighted anatomical scan was obtained for structural reference. Image processing and statistical analyses were performed using MATLAB (The Math works Inc., Natick, MA, USA) and SPM8 (SPM; Wellcome Department of Imaging Neuroscience, London, UK; <http://www.fil.ion.ucl.ac.uk>). The pre-processed fMRI data were entered into first-level individual analysis in order to obtain parameter images for the contrasts of each condition. Second-level group analysis with two-sample t-test was then used to find the main effect of between contrast differences. The SPM{F}s were thresholded at  $P < 0.05$ , false discovery rate (FDR)-corrected for multiple comparisons across the whole brain. All subjects signed an informed consent and agreed to participate in the fMRI study. The study protocol was approved by the Institutional Review Board.

### Results and Discussion

The between group analysis revealed that a combination of a celebrity face and a car showed higher activation in orbitofrontal cortex (OFC), temporal pole and insula compared to a combination of an ordinary face and a car ( $P < 0.05$  FDR corrected for multiple comparisons, Fig. 2). In addition, there was a statistically significant correlation between percentage BOLD activity at OFC, temporal pole and preference scores ( $r = 0.302$ ,  $P < 0.05$  for OFC and  $r = 0.267$ ,  $P < 0.05$  for temporal pole respectively, Fig. 3). Furthermore, celebrity context showed higher left-lateralized brain activity. Our finding of higher activity in OFC is consistent with previous research that the OFC is crucial for preference judgments of product [2] and face of celebrity in this study was associated with motivationally salient and rewarding stimuli, which could enhance the activation of the OFC. It is well recognized that anterior temporal lobe including temporal pole play a crucial role in social memory in relation to representing and retrieving social knowledge such as people, their names and biographies and social concepts. In particular, the anterior temporal lobe is involved in encoding and storing emotionally tagged social knowledge, which may guide the OFC based decision processes. Therefore, our fMRI findings suggest that increased activation of OFC and temporal pole is associated with in retrieving specific memory and semantics of celebrity. Furthermore, these activations of distributed neural networks were positively correlated with preference scores. Thus, it is possible that positive attitude and feeling for celebrity and unique memory and semantics of it may have an impact on favorability for car advertising. Therefore, this study supports celebrity power on car advertising and provides neural mechanisms in relation to it.

1. Atkin, C., & Block, M. (1983). Effectiveness of Celebrity Endorsees. *Journal of Advertising Research*, 23(January), 57-61.
2. Erk, S., Spitzer, M., Wunderlich, A. P., Galley, L., & Walter, H. (2002). Cultural objects modulate reward circuitry. *Neuroreport*, 13, 2499–2503.

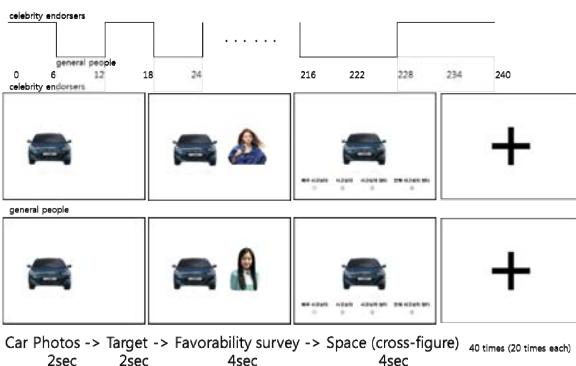


Figure 1. Neuromarketing paradigm for a combination of a celebrity (ordinary) face and a car.

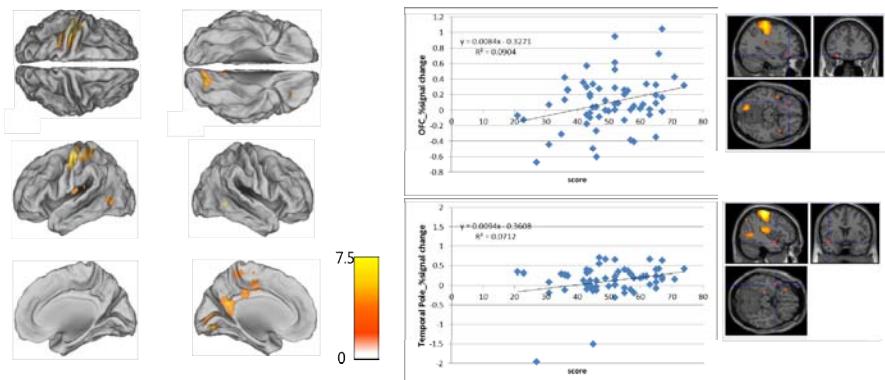


Figure 2. two sample t-test ( $P < 0.05$  FDR corrected for multiple comparisons across the whole brain)

Figure 3. Percentage BOLD signal change in OFC and Temporal pole showed positive correlation with preference score.