



# Impact of Country of Origin and Brand Logo on the Acceptance of Luxury Price Based on Brain Evoked Potential Analysis

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## ABSTRACT

In order to reveal the Brain evoked potential analysis neuro-mechanism of the impact of external clues on consumers' acceptance of luxury price through the use event-related potentials (ERPs), this paper took the consumers' purchase of luxury goods as background to simulate the shopping scenario of luxury goods through experiments. The event-related potential (ERP) method was used to record the brain electrical activities of the subjects during the decision-making process. This study designed experiment 1 and 2 to examine the impact of the clue of single-double country of origin and the existence of brand logo on the acceptance of luxury price. Studies have shown that the clue of single country of origin are more conducive to consumers' acceptance than the clue of double country of origin; the logo design are also more conducive to consumers' acceptance of price.

**Key Words:** Brain Evoked Potential Analysis, Consumer, Country of Origin, Brand Logo

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## Introduction

Event-related potential (ERP) is a high time-resolution, atraumatic brain scan technique (Zhang *et al.*, 2014), which can extract bioelectrical activities related to specific cognitive events from electroencephalogram (Brain evoked potential) by superposition averaging technique (Sebel *et al.*, 1997). ERP components can be roughly divided into exogenous and endogenous components (Lehnertz *et al.*, 2001). Exogenous components are strongly influenced by physical stimulus and are the early products of the human brain for stimulus, such as auditory P50, visual C1, etc; endogenous components are closely related to the processing of people's attention and memory, reflecting the process of perceptual or cognitive formation processing, which will not be affected by the physical properties of stimulus, such as P3, N400, etc. Endogenous components

are the focus of research on the mechanism of brain activities in people's cognitive processes. ERP is used to record the multiple brain components induced by the decision-making process, which is of great significance for studying the psychological cognitive process of subjects (Al-Nashash *et al.*, 2016). Many studies have found the connection between brain activities and consumer behavior. Some studies have also shown that there is a strong correlation between brain electrical activities measured in real time and choice behavior (Sree *et al.*, 2013). The N2 component is a negative component in the ERP waveform with an incubation between 200-350 milliseconds. The origin of N2 components is mainly distributed in the Anterior Cingulate Cortex (ACC) in the brain, which is responsible for monitoring the target-directed behavior. Studies have shown that N2 is sensitive to

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mismatches and is a reflection of conflict and its amplitude increases with the degree of conflict (Gramfort *et al.*, 2013). The N2 component is sensitive to the occurrence of cognitive conflict and may be used as an electrophysiological indicator of price-cognitive conflict in price-acceptance studies. The LPP component is a late positive potential with a peak at 350-650 ms. This component is distributed in the midline of the brain and arrived at its maximum in the central apical region (Mensen *et al.*, 2013). Previous studies have shown that LPP is related to emotional processing, especially motivational emotional arousal (Saastamoinen *et al.*, 2013). In particular, in a study of luxury goods that was developed using a neuroscience approach, researchers asked subjects to watch luxury goods and mass-brand goods, and recorded changes in the amplitude of LPP associated with emotional arousal due to the. The experiment found that the amplitude of LPP triggered by luxury goods increased significantly with presence of other people, showing a more visible LPP waveform than the mass consumer brand. The results of this study demonstrated that the amplitude of LPP when actively watching high-arousal marketing images could reflect the concerns and motivation evoked by arousal (Berta *et al.*, 2013).

Decision-making neuroscience methods have been used in the research of luxury goods and price. Although these two types of studies started relatively late and the research results were not enough, it still could be seen from the relevant research results that decision-making neuroscience methods could help record the changes in the brain neural electrophysiology in cognitive activities accurately, thus objectively reflecting the neurophysiological mechanism behind consumer behaviors and helping us better understand luxury consumption and price acceptance behavior (Gnatkovsky *et al.*, 2014). Luxury consumption in the middle class relies heavily on external clues. The study has found that the clue of country of origin and brand logo has an impact on luxury consumption behavior. However, specific studies have not yet been conducted on the acceptance of luxury price and the neuropsychological mechanism of external clues on the acceptance of luxury price is still not understood. Therefore, this research used the experimental technique of event-related potentials in neuroscience to explore the neuropsychological mechanism of the impact of two types of basic external clues, namely country

of origin and brand logo, on the acceptance of luxury price, which was a breakthrough compared with previous researches.

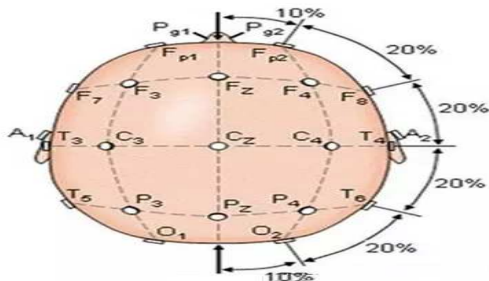
## Methods

This study designed experiment 1 and 2 to examine the impact of the clue of single-double country of origin and the existence of brand logo on the acceptance of luxury price. The experiment took the consumers' purchase of luxury goods as background and simulated the shopping scenario of luxury goods through experiments. The event-related potential (ERP) method was used to record the brain electrical activities of the subjects during the decision-making process.

There were 16 subjects in experiment 1 (including 9 females and 7 males), who were all MBA students from Zhejiang University or Zhejiang Sci-Tech University. The pre-test questionnaire contained the top five brands of luxury watches (Patek Philippe, Vacheron Constantin, Audemars Piguet, Cartier and Rolex). The main stimulus image included two parts: information of price and country of origin. The country of origin information included the two dimensions, which were the country of origin and the country of manufacturing. The stimulus brand country in the experiment included France and Switzerland, and the stimulus manufacturing country included France, Switzerland and China. The stimulus that was consistent between the brand country and the manufacturing country was the stimulus of the single country of origin; the stimulus that was inconsistent between the brand country and the manufacturing country was the stimulus number of the double country of origin. In the experiment, there were a total of 160 trials, of which the number of stimulus of the single country of origin and the double country of origin were 80 respectively.

The 20 females in experiment 2 were university students or MBA students from wealthy families. The average annual household income is ¥10,000-¥30,000. The content of the stimulus image consisted of two parts: a wallet image and a price tag. The reason for the selection of wallets as the stimulus material was partly because wallets accounted for comparatively a large proportion in the sales of luxury leather goods. Besides, the wallets were small entry-level luxury items. For our group of participants, they could afford them. But used them in open occasions. More importantly, the size of the wallet just allowed us to see the brand trademark

information in the picture clearly. In the stimulus material, the wallet image could be divided into two groups according to the presence or absence of the wallet logo. The material and style of these wallets were the same between groups but different within the group.



**Figure 1.** Point Distribution of Brain evoked potential Record System of International 10-20 System

The experiment stimulus were randomly presented in the center of the computer screen through the use of EPRIME software. The distance between the experimental subject and the screen presenting the stimulus was about 70 cm and the horizontal and vertical viewing angles were 2.58° and 2.4° respectively. The presenting sequence of individual trial was: initially, a fixation point appeared in the center of the computer screen for 800 ms, followed by a gray screen with a random stimulating interval (ISI) of 500-800 ms; then the computer screen presented the main stimulus, and the duration was 4000 ms. During this period of time, the participants needed to make price decisions, and the stimulus disappeared after pressing the key. The experiment was performed on a 64-lead Brain evoked potential recording system produced by Neuroscan Inc. in the United States to record the Brain evoked potential and analyzed the collected data using the Scan 4.3 analysis system. The corresponding Brain evoked potential was recorded using a 64-lead Ag/AgCl electrode cap and the electrode position distribution complied with the international 10-20 system, as is shown in Figure 1. The filter bandpass was 0.05-100Hz and the frequency adopted was 500Hz/lead. The contact resistance between the electrode and the scalp during the experiment was less than 5kΩ.

**Results and Discussion**  
*Experiment 1*

The results of the price acceptance rate of luxury goods in single country of origin and double country of origin are shown in Table 1:

**Table 1.** Comparison of Price Acceptance Rate between Single Country of Origin and Double Country of Origin

	Mean value	Standard deviation	Sample number
Single country of origin	82.27	26.76	16
Dual country of origin	45.70	19.74	16

Referring to the research results of components in literature W and the brain electricity results in this study, time window selected in this study is 250-350ms. The descriptive statistics of the amplitude of N2 component at the 9 electrode points are shown in Table 2.

**Table 2.** Descriptive Statistics of the Amplitude of N2 component Caused by Single and Double Country of Origin

Electric pole	Single country of origin		Dual country of origin	
	Mean value	Standard deviation	Mean value	Standard deviation
F1	-0.573	0.651	-1.083	0.623
FZ	-0.936	0.736	-1.635	0.615
F2	-0.820	0.800	-1.628	0.679
FC1	-0.027	0.619	-0.879	0.736
FCZ	-0.584	0.790	-1.304	0.661
FC2	-0.383	0.764	-1.196	0.695
C1	0.742	0.660	-0.003	0.593
CZ	-0.155	0.781	-0.957	0.676
C2	0.238	0.734	-0.248	0.626

In order to analyze the relationship between the N2 components of the single country of origin group and the double country of origin group, pairing tests are further performed on these two types of stimulus. The results are shown in Table 3. The results show that the amplitude of N2 of the double country of origin group (M=-0.993, SE=0.633) is greater than the amplitude of N2 in the single country of origin group (M=-0.278, SE=0.699), and the p=0.030<0.05.

Based on the results of previous studies, the purpose of this study, and the experimental paradigm of this study, this study selects LPP components for Brain evoked potential data analysis. In order to analyze the relationship between LPP components between the single and double country of origin group, pairing tests are further performed on these two types of stimulus. The results are shown in Table 4. The results indicate that the LPP amplitude (M=4.838, SE=0.630) in the single country of origin group is significantly greater than that in the double country of origin group (M=3.959, SE=0.543), and the P=0.038.



**Table 3.** Pairing Test of N2 amplitude in Single and Double Country of Origin

COO (I)	COO (J)	Mean difference(I-J)	Standard error	Sig.	95% confidence interval of difference	
					Lower limit	Upper limit
Single	Double	0.715	0.298	0.030	0.079	1.351

**Table 4.** Pairing Test of LPP amplitude in Single and Double Country of Origin

COO(I)	COO(J)	Mean difference(I-J)	Standard error	Sig.	95% confidence interval of difference	
					Lower limit	Upper limit
Single	Double	0.878	0.385	0.038	0.058	1.699

**Table 5.** Pairing Test of N2 Amplitude in the Unmarked and Marked Groups

COO (I)	COO (J)	Mean difference (I-J)	Standard error	Sig.	95% confidence interval of difference	
					Lower limit	Upper limit
No sign	Sign	-1.781	0.330	0.000	-2.471	-1.090

**Table 6.** Pairing Test of LPP Amplitude in the Unmarked and Marked Groups

	Mean difference	Standard deviation	The value of T	Saliency	95% confidence interval of difference	
					Lower limit	Upper limit
No sign - sign	-1.543	0.152	0.000	-1.862	-1.224	-1.543

The behavioral data of the price acceptance rate shows that the price acceptance rate in the single country of origin where the brand country is consistent with the manufacturing country is significantly higher than double country of origin where the brand country is inconsistent with the manufacturing country. This shows that the subjects are prone to be influenced by the clue of single/double country of origin in the decision-making process of price acceptance. Compared with double country of origin, the clue of single country of origin is more conducive to the price acceptance of consumers.

**Experiment 2**

After the emergence of stimulus material, the N2 component is triggered by both unmarked and marked groups. Based on the purpose of the experiment, the characteristics of the total average waveform, and the derivative distribution characteristics of N2 components, nine electrode points located in the frontal area (F1, FZ, F1), the frontal central joint area (FC1, FCZ, FC2) and the central area (C1, CZ, C2) 9 are selected as the representative points for the analysis. The incubation period of N2 ranges from 250 to 350 milliseconds. The results of further pairing sample T-test show that the amplitude of N2 in the unmarked group (M=-2.792, SE=0.724) is significantly greater than that in the marked group (M=-1.012, SE=0.928), and the P=0.000<0.05 (as shown in table 5).

After the emergence of stimulus materials, LPP component is triggered by both unmarked and marked commodities all triggered. Nine electrode points are selected as the representative

points for the analysis. The incubation period of LPP ranges from 350 to 650 milliseconds. The results of further pairing sample T-test show that the amplitude of LPP in the marked group (M=4.869, SE=1.074) is significantly greater than that in the unmarked group (M=3.326, SE=1.040), and the P=0.000<0.05 (as shown in table 6).

The behavioral data show that the price acceptance rate of luxury goods in the marked group is significantly higher than that in the unmarked group, which shows that the subjects are significantly influenced by the presence or absence of the logo in their decision-making process of the acceptance of luxury price. The design of the logo can promote the acceptance of luxury price of consumers.

**Conclusion and Prospects**

Through the analysis of Brain evoked potential analysis data, it is found that the price acceptance rate in the single country of origin where the brand country is consistent with the manufacturing country is significantly higher than double country of origin where the brand country is inconsistent with the manufacturing country. This shows that the subjects are prone to be influenced by the clue of single/double country of origin in the decision-making process of price acceptance and compared with double country of origin, the clue of single country of origin is more conducive to the price acceptance of consumers. The price acceptance rate of luxury goods in the marked group is significantly higher than that in the unmarked group. This behavioral result shows that the subjects are significantly influenced by the presence or absence of the logo in their



decision-making process of the acceptance of luxury price. The design of the logo can promote the acceptance of luxury price of consumers. Studies have shown that brain neuro-mechanism can reflect the impact of external clues on the acceptance of luxury price.

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