

Small Price Index of College Students Based on EEG

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Abstract

Study of consumer psychology and consumer price index usually used questionnaire method; this method is very good at solving the macro problem, however, to specific numerical value index, used questionnaire method is difficult to determine, and there is always a certain doubt about the correctness of the results what used questionnaire method. Because of EEG can be true reflection of the true psychological characteristics of the subjects, the paper selects EEG analysis tool as the consumer price index. Subjects tested with the different combination of the different quantity of money, processed and analysis this three sets of subjects EEG data, by analyzing the time and amplitude of the N170 and P300 to study college students in the daily life of the small consumer index.

Keywords: *electroencephalogram, price index, event-related potential, college students*

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1. Introduction

The consumer price index, defined in this paper as the emphasis on the number of disposable consumer money. For example, to buy a book, when the definition of price \$ 44, the consumer can not hesitate to buy, but when the price is \$ 45, consumers will have short-term thinking, and may eventually buy , or may not, At this time, \$ 45 is the consumer price index of consumers this book. Small, defined in this paper as a one-time expenditure of less than \$ 50 in daily life.

Economic development has led to the development of the level of consumption and then, the amount of disposable spending that cause people attention is changing. But, because of the comparisons psychological, many people deliberately conceal the amount of money of their own attention, and college students are especially prominent.

College students as an important part of the social consumer groups, the consumer price index have a certain degree of representative. Consumption-related research on college students, now focuses on consumer behavior in college students, the analysis of consumer attitudes and consumption status and analytical tools questionnaire, the main purpose is to investigate whether the consumption situation of university students reasonable consumption structure, whether consumer psychology is health [1-4]. Questionnaire method for macro statistics on certain positive significance, but it is difficult to define the consumer price index on the microscopic.

Electroencephalogram (EEG) signals derived from the voltage changes, this change Caused by the brain cells stimulated. If this change caused by outside specific event, this is called Event-related potentials (ERP). ERP occur within a short time after the stimulus signal appears, so, ERP is a true reflection of the people to the stimulation. A true reflection of the objective things, this characteristic EEG is now used as a tool for the identification [5-7].

In this paper, the EEG as a tool to study the small consumer price index in the daily lives of college students. Did EEG acquisition experiment for three groups of subjects, and the experimental model was designed to be as follows mode: five different denominations picture was assigned one group, and each subject did five different combinations experiment. The Scan was used to process EEG signal, used average method to calculate the ERP components,

then contrast calculation N170 and P300 feature, finally, calculated different subjects the consumer price index.

2. Data Acquisition

The EEG data used in this paper is come from BCI Laboratory of Jiangxi University of Technology; the subjects were divided into three groups, two groups of boys, a group of girls, each five; Experiment with a picture is divided into remind and no remind two groups.

Subjects in a quiet room to relax sitting on a soft no arm chair, watching the front of the computer screen, Subjects do experiment according to the guidance of the experimenter and the screen instructions. Each experiment with one hundred eighty-seven tasks and each subject do experiment four-times. The recording was made with 32-channel amplifier from Neuroscan, bilateral mastoid reference electrode is adopted as the reference electrode, and EEG was sampled with 1000Hz, with 0.05Hz~200 Hz band-passes and 50Hz notch.

Subjects in front of a computer screen, random denominations (in this paper, each group arrangement of five denominations) picture shows. The five pictures in each experiment show the same times, in each experiment, each picture display 750 ms, and then the screen black 1000 ms. Stimulation pattern shown in Figure 1:

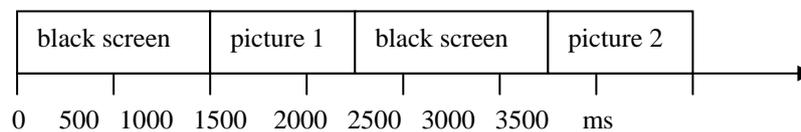


Figure 1. Stimulation Pattern Diagram of EEG

3. Data Processing

ERP can express some stimulate events to EEG signal, this stimulate event include visual, auditory , and so on, and this EEG signals include the character of physical stimulation and psychological factors, so, ERP component analysis is the subjects psychological study of a powerful tool, widely used in the field of cognitive psychology, psychiatry, and brain-computer interface.

ERP is given to some external stimulus or stimuli revocation cause a potential change in different brain regions in the brain. Classic ERP components such as P300, MMN and N170, P300 Sutton et al found in 1965, its main feature is a positive wave in the incident about 300 milliseconds, and psychological factors related to the endogenous component its incubation period mainly the physical meaning is reflected in the subjects to stimuli, or classification of the time required, volatility reflect the background or memory updated with MMN (are matched negative wave) mainly reflects the ability of the brain of the automatic processing of information; N170 mainly used in the encoding of face recognition intuition.

This paper is primarily on the ERP component analysis, so before analysis the data must preprocess the data. The main data processing step are as follows:

Step 1. Removal the larger drift of EEG: the EEG acquisition process, something such as movement, inattention and outside sound will affects initial EEG great drift appear, these will affect the calculation of follow-up EEG. So during the EEG before calculated, must remove this part of the EEG;

Step 2. Removal of EOG interference: blink or look around will affect the original EEG signals, and this effect will affect the feature extraction. So, before extract the feature, this effect must be removed. In this paper, we mainly remove the effect of vertical EOG.

Step 3. Epoch the task: Figure 1 shows, the subjects EEG sampling rate of 1000Hz per task to collect 1750Ms, in order to better reflect the characteristics of task. In this paper, the interval time we set between 10% of the time before stimulation and 80% of the time after stimulation.

Step 4. Baseline correction: Because a lot of the data is not in the baseline, and therefore this paper were carried out twice baseline correction and a linear correction.

corresponding to 35, money-2 for event 2, corresponding to 50, money-3 for an event 3, which corresponds to 40, money-11 as an event 11, corresponding to 45, the Money-22 as an event 22, which corresponds to 47. The x axis is time and the y-axis is the EEG dropout. As illustrated, in the time coordinate as an obvious point to the negative direction of the peak of about 170, this peak route no. N170, the subjects of the picture there is a very obvious reflect, at the time of 300ms after five events respectively a pointer to the peak of the positive direction, peak for all five events, event money-3 peak appears significantly ahead of the other four times more strongly to the group of subjects reaction of events, it is clear, in accordance with the design of this article the experimental mode subjects the consumer price index of 40.

(2) Figure 4 is a female group 35, 40, 45, 47, 50 combinations, five kinds of events under the electrodes Pz comparison chart, wherein the money-1 event 1 (electrode: PZ), corresponding to 35, money-2 as events 2, corresponding to 50, money-3 for an event 3, which corresponds to 40, money-11 as an event 11, corresponding to 45, money-22 as an event 22, which corresponds to 47. The x axis is time and the y-axis is the EEG dropout. As shown in the figure N170 is not very clear, there mainly because female hair long, so the acquisition of EEG noisy, but look at the time from the P300, money-11 event than any other event apparent as early as that description in accordance with the consumer price index of the subjects in the experimental mode designed in this paper is 45.

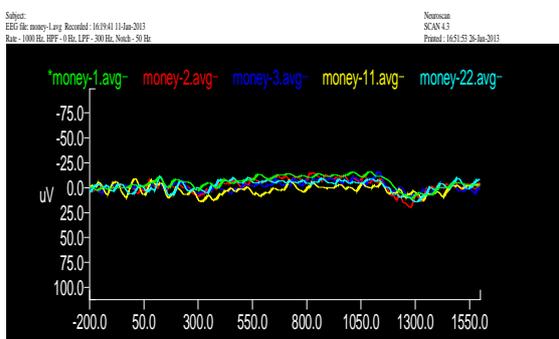


Figure 4. Pz Electrode, Female Comparison Chart of the Different Events

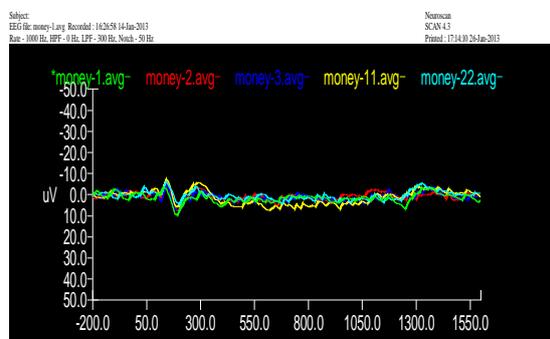


Figure 5. Pz Electrode, Disability Subjects Comparison Chart of the Different Events

(3) of disability subjects Figure 5 for the experiment of the selected on 35, 40, 45, 47, 50 combinations comparison chart of the five events in the electrode Pz, which money-1 event 1 (electrode: PZ), corresponding to 35, money-2 as events 2, corresponding to 50, money-3 event 3, which corresponds to 40, money-11 as an event 11, corresponding to 45, money-22 as an event 22, which corresponds to 47. The x axis is time and the y-axis is the EEG dropout. This peak is N170, description of the subjects have an obvious reflection of the picture, but look at the time from the P300, money-1 event than any other event appear obvious and early words, in accordance with the experimental model designed in this paper the subjects of the consumer price index of 35.

From the above analysis we can draw the following conclusions: girls, compare to boys is lower than the sensitivity of money, due to the limitations of their own conditions, the highest sensitivity of students with disabilities on the money. Why girl's consumer price index higher than boys? After test subjects identity, family and daily habits, understanding, similar to the economic background of the subject's family, but the girl's average weekly shopping trips than boys, the ordinary boys average weekly shopping trips than disability boys, so transactions frequent degree is one of the reasons that affect the consumer price index.

The experimental picture shown in this paper experimental data were divided into two groups, one group with a prompt, a group without prompts research plus prompt subjects to compare two groups of EEG study, as Figure 6 shown, money-1 does not add Step 1 plus Step. From on the N170 ingredients, with tips N170 obvious than without a prompt appears early; From the P300 component, with tips than without prompts significantly. Show that prompted the EEG has some impact.

5. Conclusion

The small consumption occurs mainly in the daily life, although the amount is small, but can fully reflect the level of people's daily life and consumer psychology, the more times the representation of the consumption of college students. Consumption due to the lack of effective means students study at this stage is still stuck in the questionnaire-based method. This article EEG as tools, test different types of subjects, the EEG acquired ERP component analysis, which study subjects' small consumer index.

Experimental of group consumer price index for the girls that stay in the 45, that is in the process of daily consumption, if priced at 45 Yuan when girls pay the bill before there will be a brief hesitation; boys, the consumer price index stays at 40, while men with disabilities the consumer price index stay in the 35. At the same time, comparison tests showed that two kind of stimulation patterns, plus prompt be subjects to judge certain impact.

This paper attempts to use EEG to study consumer psychology, and has a certain nature, but the results of this paper is to explain how from the daily behavior, why would produce such a result is this study in-depth local, the other due to the study population than the article only three groups of subjects to study whether the results with the universality of the next step is to study the direction.

EEG is a direct response of the human mental activity, EEG can explain a lot of the daily behavior, EEG introduced originally belonged to the field of social psychology research to the study will bring a lot of newresearch tools, and better able to explain the activities of the operating mechanism of the brain, which is the order of the value of this study

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