

Experimental Design and EEG-GSR Processing Pipeline for Price-Based Customer Decision-Making: A Pilot Study

1st Ludmila Kralikova

Dept. of Electromagnetic and
Biomedical Engineering
University of Zilina
Zilina, Slovakia
ludmila.kralikova@feit.uniza.sk

2nd Juraj Spanik

Dept. of Electromagnetic and
Biomedical Engineering
University of Zilina
Zilina, Slovakia
juraj.spanik@feit.uniza.sk

3rd Branko Babusiak

Dept. of Electromagnetic and
Biomedical Engineering
University of Zilina
Zilina, Slovakia
branko.babusiak@uniza.sk

Abstract—This pilot study presents an experimental design and multimodal processing pipeline combining electroencephalography (EEG) and galvanic skin response (GSR) for investigating price-based customer decision-making under changing price information. Five participants completed two blocks of a sequential product-choice task, comprising 48 trials per participant and 240 trials in total. Each trial included an initial product preference, a first purchase decision, a second price presentation, a second purchase decision, and a subjective rating. EEG, GSR, and behavioral events were synchronized and analyzed using an event-locked processing framework. The primary analysis compared price-conflict and no-conflict trials during the second price presentation, where price conflict was operationally defined as a trade-off between product tier and price. Changes between the first and second purchase decisions were examined exploratorily. Conflict trials showed a descriptively more positive centroparietal ERP response across the predefined P3-like and LPP-like intervals. Trials in which participants changed their product choice showed a more positive P3-like response, higher phasic GSR activity, and longer reaction times. Although limited by the small sample size and unequal condition counts, the findings demonstrate the feasibility of the proposed pipeline for capturing complementary neural, autonomic, and behavioral patterns associated with price-driven decision updating.

Keywords—EEG, GSR, customer decision-making, price conflict, P3, LPP, multimodal signal processing

I. INTRODUCTION

Consumer purchase decisions are influenced by product evaluation, price information, and the way in which price is presented or framed. Previous event-related potential (ERP) research has shown that price framing can modulate both purchase-related behavior and neural responses during consumer decision-making [1]. However, behavioral measures alone provide only a limited view of the underlying decision process, motivating the integration of physiological measures in consumer neuroscience [2].

Consumer neuroscience combines behavioral data with physiological signals to capture complementary aspects of cognitive and autonomic processing during decision-making [2], [3]. Electroencephalography (EEG) enables event-locked analysis of rapid neural responses, whereas galvanic skin response (GSR) reflects slower changes in autonomic arousal [3]. In EEG research, P3/P300 activity has been associated with stimulus evaluation, attention allocation, and context updating [4].

When EEG and GSR are recorded within the same sequential decision task, their different temporal dynamics require accurate event synchronization, modality-specific preprocessing, and appropriate event-related analysis.

This pilot study presents an experimental design and multimodal EEG–GSR processing pipeline for analyzing price-based customer decision-making under changing price information. The aim was to determine whether EEG, GSR, and behavioral data could be synchronized, preprocessed, integrated, and summarized at the participant level to reveal preliminary neural, autonomic, and behavioral patterns associated with price conflict and choice switching.

II. MATERIALS AND METHODS

A. Participants and Experimental Task

Five participants completed two experimental blocks containing 24 trials per block, resulting in 48 trials per participant and 240 recorded trials in total. Before the experiment, participants were informed about the study procedure and provided written informed consent. Participants performed a sequential product-choice task in which two product alternatives were presented and evaluated. After indicating an initial preference, participants viewed the first price context and made a first purchase decision. A second price presentation then introduced an updated price context, after which a second purchase decision was made. Each trial ended with a subjective rating. The multimodal recording setup is shown in Fig. 1.

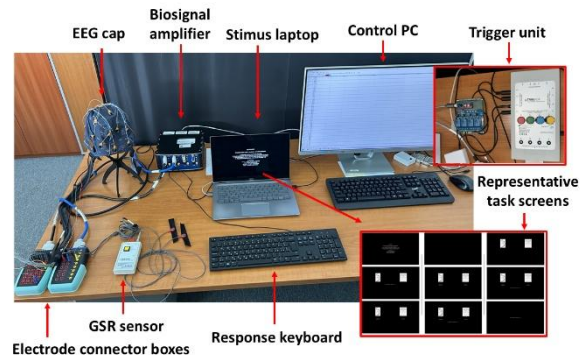


Fig. 1. Experimental setup for multimodal EEG-GSR recording during the sequential product-choice task.

The setup included a stimulus laptop, response keyboard, trigger unit, control computer, 19-channel EEG cap, g.HIamp biosignal amplifier, and g.GSR sensor. Experimental events