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Introduction: Predicting what kinds of behavioral decisions will be made by individuals or groups has been a challenging puzzle for social scientists (Ariely & Berns, 2010). Often times, apparel purchase involves evaluating the tradeoff between the pleasure of acquiring a preferred product and the pain of paying money for it. The actions driven by the valence from the tradeoff can trigger two types of behaviors: *buy* (approach) and *not buy* (avoidance). Although early research has examined the neural correlates (individual brain region) which *independently* predict purchase decisions (Knutson, Rick, Wimmer, Prelec, & Loewenstein, 2007; Plassmann, O'Doherty, & Rangel, 2007; Raab, Elger, Neuner, & Weber, 2011), it is unknown if patterns of brain activity (multiple brain regions as a whole) can predict the purchase choices in haptic-information-required decisions such as purchasing an apparel. In this paper, we used functional magnetic resonance imaging (fMRI) to study the brain activations preceding the purchase decisions under the 3 most common online presentation strategies, namely, static picture (Picture), image zooming (Zooming), and rotation video (Rotation). Jai, O'Boyle, & Fang (2014) suggest that different visual presentation strategies, evoke different cognitive and affective brain functions during the product-evaluation and purchase decision processes. The purpose of this study is to identifying the most predictive brain activity pattern from the three most commonly used online visual presentation strategies.

Methodology: Sixty real apparel purchase decisions were made by 24 subjects during data acquisition. Subjects were offered $50 to bid on apparel products for themselves during the MRI scanning as compensation for their participation. The functional imaging was conducted using a Siemens 3.0 Tesla Skyra to acquire gradient echo T2-weighted echoplaner images (EPI) with blood oxygenation level-dependent (BOLD) contrast. Functional data were collected in three blocks (Picture, Zooming, and Rotation); each block consisted of 20 apparel products and 268 whole brain images (from each participant). The Human Research Protection Program where the study was conducted approved this study, and each subject provided informed written consent prior to participation. Four subjects were excluded from the analysis because they did not make a bid decision (i.e. a *buy* decision) within a block or they made a bid in every trial within a block.

Analysis and results: Since current evidence suggests that purchase decisions are multi-factorial and cannot be reduced to a single brain area of function, the multivariate approach has been suggested to have a better prediction power of predicting economic decisions such as purchase an apparel (Ariely & Berns, 2010). To examine whether brain activation during the product-evaluation phase can predict the following *buy* vs. *not buy* decisions, we used machine-learning to train computer to learn the best predictive brain patterns from the neuro-imaging data--a multi-

variate approach. The linear support vector machine (SVM) algorithm from an open-source library LIBSVM (http://www.csie.ntu.edu.tw/~cjlin/libsvm/) was used to perform the task. The whole-brain classification analysis revealed high prediction accuracies at all three blocks (Picture: 75%, $p < 0.001$; Zooming: 95%, $p < 0.001$; Rotation: 95%, $p < 0.001$). Moreover, the Cross-category classification results showed that the brain activation patterns learned in different blocks can effectively predict the purchase decisions (accuracy ranging from 85% to 95%) made in the other two blocks (Table 1).

Table 1 The cross-category validation results of using the patterns learned from the training data to predict the purchase decisions in other conditions (N=20)

Blocks		Test data (accuracy rate of decisions)			
		Picture	Zooming	Rotation	Average
Training data from	Picture	-	85%	80%	82.5%
	Zooming	80%	-	95%	85%
	Rotation	85%	95%	-	90%

Findings and conclusions:

The results suggest that apparel purchase decisions can be predicted with high accuracy using brain activity patterns arising during the product evaluation process. The high accuracy rates may indicate a promising research direction to understand consumers' purchase decisions of experiential products such as apparel. This study aimed at predicting consumers' purchase decisions conducted in apparel shopping context, in which, haptic information is an important element for decision making. Remarkably, the most significant contribution of the present study is the findings of a neuro-activity pattern that consumers use to make value-based decisions such as apparel shopping. For the theoretical implication, the results support the long-standing *stimulus-organism-responses* model (Mehrabian & Russell, 1974). For the practical implications, this study provides empirical evidence of the effectiveness of using brain activation patterns to predict consumers' apparel purchase decisions.

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