Correlation of liking and disliking measurements in consumer acceptance tests

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ABSTRACT

Understanding how people conceptualize their percepts of liking and disliking is important in determining which conceptualization process – bipolar or bivariate – dominates our conceptualization process when assessing acceptability of food products. The objective of this research was to identify the existence of bivariate conceptualization by determining the relationship between percepts of liking and disliking in assessment of actual food products. Six consumer acceptance tests were conducted with Korean rice wines, soy-whole-grain beverages, high protein snacks, and ten familiar commercial food products, using liking and disliking unidirectional scales. Pearson correlation coefficients and Spearman's rank correlation coefficients were calculated to determine the relationship between liking and disliking percepts. Ninety-seven percent of samples had medium or low levels of correlation coefficients, which demonstrated that the subjects utilize bivariate conceptualization more so than bipolar conceptualization. Higher inverse correlation were shown for the familiar commercial food products tested than the novel food products, demonstrating the existence of a stronger bipolar conceptualization process when the products were familiar to subjects. However, the intensities of correlation for familiar food products were not strong to claim bipolar conceptualization. Further research is recommended to validate the practical utilization of the bivariate conceptualization process in sensory consumer tests through comparison of liking and disliking ratings to the rating by 9-point hedonic scale.

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1. Introduction

The application of rating scales to the evaluation of foods dates back to the 1920s, when the use of sorting and grading systems began (Boogs & Hanson, 1949). The consumer acceptance testing scale for food products was developed during the 1940s by the Quartermaster Food and Container Institute for the U.S. Armed Forces to measure food preferences and the degree of liking for certain foods among soldiers (Peryam & Girardot, 1952). This scale is now known as the 9-point hedonic scale. The scale was developed through the selection of descriptive phrases, the comparison of various bipolar scales, and the length of time required for ratings (Jones, Peryam, & Thurstone, 1955; Peryam & Girardot, 1952; Peryam & Pilgrim, 1957). During the development of the scale, the researchers assumed that the response categories of "like" and "dislike" were along the same continuum of preference (Peryam & Pilgrim, 1957).

After the introduction of the 9-point hedonic scale, it became widely used in the field of consumer sensory science for the purpose of measuring the hedonic assessment of food and nonfood items (Lawless & Heymann, 1998). This scale gained popularity, because it was simple to use and easy to implement (Lawless & Heymann, 1998). Several consumer acceptance testing scales, such as the food action rating scale (FACT) (Schutz, 1965), the labeled affective magnitude scale (LAM) (Cardello & Schutz, 2004; Schutz & Cardello, 2001), and the hybrid hedonic scale (Villanueva, Petenate, & Da Silva, 2005), were developed after the introduction of the 9-point hedonic scale, in order to resolve its inherent limitations. These scales were also developed based on the bipolar continuum of human attitudes, which was initially introduced by Thurstone studies (Thurstone, 1931; Thurstone & Chave, 1929) in his studies on social attitude measurement. The 9-point hedonic scale, FACT, LAM, and the hybrid hedonic scale all share the assumption that the relationship between the percepts of liking and disliking are reciprocal and interchangeable, because they were developed based on the bipolar conceptualization theory.

Contrary to the mainstream concept of bipolar conceptualization, which is the backbone of the consumer acceptance testing scales, psychologists in the 1960s proposed that positive and negative attitudes have a low correlation (Bradburn, 1969; Green &

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Goldfried, 1965). Bradburn (1969) proposed that positive and negative attitudes were independent of each other because the correlation coefficients between them in the measurement of human well-being were low or not significant. The evidence for the independence of positive and negative attitudes presented in Bradburn's research has led to arguments whether the human conceptualization of positive and negative attitudes is bipolar or independent (Diener & Emmons, 1984).

This theory of independence of positive and negative affects was further stretched to the bivariate conceptualization by presenting four different conceptual relationships that pertain to positive and negative affects (Cacioppo & Berntson, 1994). Four different conceptual relationships from the bivariate conceptualization – reciprocity, co-activity, uncoupled positive, and uncoupled negative – have shown that human conceptualization is more complex than the mere bipolar approach, which forces subjects to present their opinion on a single point of the bipolar scale (Cacioppo & Berntson, 1994; Cacioppo, Gardner, & Berntson, 1997). The bivariate conceptualization was supported by a number of human attitudinal and emotional studies in the fields of psychology and consumer behavior by presenting evidence of low correlation coefficient or co-existence of positive and negative attitudes. The co-existence of happy and sad emotions after watching a movie were characterized as bivariate when sad and happy were measured using the unidirectional scales (Larsen, McCraw, & Cacioppo, 2001). Williams and Aaker (2002) also presented mixed emotions of happy and sad using photos and video clips for advertisements. In a 9-year survey with 3984 subjects, Rafaeli and Revelle (2006) verified that happiness and sadness are not bipolar opposites. Larsen and others (Larsen, McGraw, Mellers, & Cacioppo, 2004; Larsen, Norris, McGraw, Hawkley, & Cacioppo, 2009) presented evidence of the coexistence of positive and negative affects in the context of gambling through the use of various combinations of wins and losses. Andrade and Cohen (2007) proposed that the assumption of bipolarity – that is, interchangeable positive and negative affect – was not found in their research using a film clip.

In recent years, studies on the bivariate conceptualization of positive and negative affect have gained popularity in the fields of experimental psychology and consumer behavior. However, this still seems to be a novel concept in the field of consumer sensory science, which is evidenced in the lack of presence of sensory studies in the body of literature of the interdisciplinary research covering the bivariate conceptualization. To date, few researchers have commented on the potential application of the bivariate conceptualization for consumer sensory science. Moskowitz (1980) mentioned that the relationship between liking and disliking might not be bipolar. Drake (2009) proposed the 9-point unidirectional scale, which separates the measurement of liking and disliking percepts in consumer sensory science. There is, however, a lack of empirical studies on the use of the unidirectional scales to investigate the application of the bivariate conceptualization in food product assessment. Based on the literature of the bivariate conceptualization in the fields of psychology and consumer behavior, the sequence of study objective that is necessary to investigate the relevance and appropriate use of the bivariate conceptualization in the field of consumer sensory science would be to: (1) determine the relationship between the like and dislike percepts, (2) establish the number of categories that would be appropriate to use for the unidirectional scale, and (3) compare the presentation methods of the liking and disliking unidirectional scales in an actual food product test setting.

The relevance of applying bivariate conceptualization to a consumer acceptance test setting can be established by determining the relationship between the like and dislike percepts in such a setting, as the initial step of the research. If liking and disliking percepts are bipolar, the correlation between the two measurements

would be highly negative. If the two percepts are bivariate, the correlation between the two would be close to independent. Therefore, the objective of this research was to investigate the relationship between the liking and disliking percepts to determine which conceptualization process – bipolar (with a high negative correlation) or bivariate (with a low negative correlation close to independent) – is more relevant to consumer testing of actual food products.

2. Materials and methods

The unidirectional scales were used to independently measure the percepts of liking and disliking. The liking and disliking ratings derived from the unidirectional scale were, then, analyzed in order to investigate the relationship between liking and disliking percepts. A total of six consumer acceptance tests were conducted to investigate the correlation between the liking and disliking percepts. In total, 41 samples were evaluated, so as to cover a wide spectrum of acceptability in food products. The samples included unfamiliar imported products (Korean rice wines), newly developed unfamiliar products (reformulated Korean rice wines), newly developed products with familiar concepts in beverages (soy-whole-grain beverages) and snacks (high-protein snacks), and familiar commercial U.S. products that had various levels of acceptance. In addition, the same products were evaluated using unidirectional scales, which had a different number of categories, and using different gender ratios. In the following subsections the details of each consumer test within a product category. The following six consumer acceptance tests were conducted in chronological order.

2.1. Consumer acceptance test of commercial Korean rice wines

2.1.1. Participants
Ninety-six subjects (21 males and 74 females, ages 21–65 years) participated in this study. Subjects were randomly recruited from the campus of the University of Illinois at Urbana-Champaign using flyers and e-mail. Koreans and Japanese were avoided as subjects because it was assumed that they would be familiar with rice wines.

2.1.2. Samples
Six commercially available rice wines that had dominant market shares in Korea were shipped to the United States. The six samples for this test were labeled as A, B, C, D, E, and F. Approximately 10 mL of each rice wine was poured in 59.2 mL plastic cups (Solo Cup Co., Urbana, IL, USA) that were labeled with random 3-digit codes and covered with plastic lids (Solo Cup Co.). Samples were placed on a tray and refrigerated (~4 °C) for at least 1 h prior to the beginning of the test on each testing day. The samples were removed from the refrigerator approximately 15 min prior to the evaluation and were kept at room temperature (~23 °C) until the testing began.

2.1.3. Procedure
Subjects were instructed to rinse their mouths with warm water (Absopure Water Company, Plymouth, MI, USA), cracker (Unsalted tops premium saltine crackers, Kraft Foods Global, Inc., East Hanover, NJ, USA), and room temperature water (Absopure Water Company) in between samples. Subjects evaluated their degree of liking with one sample set and their degree of disliking with the other sample set using the 9-point unidirectional scales (Fig. 1) (Drake, 2009). The scales were labeled with "1 – no opinion" and "9 – like (or dislike) extremely." The presentation of the liking and disliking unidirectional scales (LDUS) were counter-balanced.