Comparison of consumer perception and liking of *bulgogi* marinade sauces between Korea and Japan using flash profiling

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Abstract This study compared the perception of and preference for seven *bulgogi* marinade sauces between Korean and Japanese consumers. Flash profiling (10 panelists each) and consumer test (97 Japanese and 102 Koreans) were conducted. Results showed that both Korean and Japanese panelists perceived the samples similarly but described using different terms. There were significant cross-cultural differences in most liking and just-about-right attributes, except texture liking and sweetness. Both consumer panelists preferred sweeter samples, but Japanese consumers rated liking for less sweet samples higher than Korean consumers. Japanese consumers considered strong saltiness, umami, and soy sauce flavor as “just-about-right,” whereas Korean consumers considered the same levels as “much too strong.” Familiarity showed a significantly positive correlation with both Korean and Japanese consumers’ liking, but authenticity was only significantly correlated with Korean consumers’ liking. This indicates that perception of authenticity might not have a strong impact on Japanese consumers’ liking.

Keywords: cross-cultural comparison, *bulgogi* marinade sauce, flash profiling, consumer liking

Introduction

Consumers’ growing interests in ethnic foods have encouraged the industry to seek for business chances in ethnic food sectors (1). In Korea, *bulgogi* has been most frequently selected as a product with a great potential for success in the global market, since it is one of the most well-known and favored Korean foods (2,3). Several studies have been conducted to identify its drivers of liking in foreign markets (4-6), but these studies primarily focused on the US and China, not Japan, where Korean foods have a market share of 30% in the ethnic food market (7). The Japanese consumers’ general perception of *bulgogi* has been assessed in surveys (2,8), but no extensive sensory study on *bulgogi* has been conducted. Therefore, it is necessary to understand Japanese consumers’ perception of and liking for *bulgogi* to explore the direction of product development in the Japanese market. This study specifically focused on a ready-to-use marinade sauce. Considering that there is a growing interest in ethnic condiments and sauces worldwide (9), the marinade sauce, which is more readily accessible to consumers through retail markets than *bulgogi* dish served in restaurants, can reach a broader population in the target market.

Previous studies have suggested that familiarity to foods, which can be developed by repeated exposures or incorporating familiar flavor components, can moderate consumers’ hedonic and sensory responses to ethnic foods (1,4,10,11). Thus, familiar foods would face less resistance from foreign consumers (1,11). However, at the same time, consumers expect exotic sensory experiences that represent unique feature of a foreign culture, which can be referred to as authenticity, from ethnic foods (12). Authenticity is perceived either in objective ways (e.g. experts’ evaluation), or in subjective ways (e.g. consumer perception based on the image that they have about the culture) (12). Thus, it is important to understand the potential effect of not only familiarity of a product but also target consumers’ perception of authenticity on liking for an ethnic food.

Conventionally, the sensory description of products is obtained using quantitative descriptive analysis (QDA). However, QDA is usually time-consuming and expensive due to extensive panel training process. Several consumer-based profiling techniques have been developed as cost- and time-effective alternatives to QDA (13). One such technique, flash profiling (FP), allows rapid description of products by combining the principles of free choice profiling and ranking (14,15). FP has been successfully applied to various products and was proven to produce a comparable result to that of conventional profiling (13). FP is known to accurately capture consumer perception by providing a rich array of descriptors of products making it a useful tool for a cross-cultural study (13).
This study was conducted to understand cross-cultural differences in sensory perception of and hedonic responses to bulgogi between Korean and Japanese consumers using FP and consumer test. In addition, non-sensory perceptions such as perceived familiarity and authenticity were measured to investigate the effect of these factors on the overall liking for the product.

**Materials and Methods**

**Sample preparation** Considering the market share ranking in each country, four Korean and three Japanese bulgogi marinade sauces were purchased (Table 1). The samples were stored at 110.2°C until use. Beef round tip was purchased from a local supermarket 1 day before sensory evaluation. The beef was sliced into 3×4×0.2 cm³ and divided into portions for each test session. Each portion was refrigerated (1±0.2°C) in a sealed polypropylene bag until usage. A portion of the beef was marinated with a sauce at a ratio of 5:1 for 30 min. The marinated beef was stir-fried for 3 min in a preheated pan (diameter 28 cm) on a high heat of a portable gas stove (Supercrown 1, Suntouch Co., Keum-san, Chungcheongnam-do, Korea). The cooked samples were immediately transferred to a 700ml-thermos to maintain the temperature at 62±4°C.

**Flash profiling**

**Panel:** Korean panelists (five males and five females, aged 20–29 years old) were recruited from Kookmin University (Seoul, Korea). Japanese panelists (one male and nine females, aged 20–39 years old) were recruited from a private Korean language institute (Seoul, Korea). The recruitment criteria for the Japanese panel were those who were born and raised in Japan, and those who had consumed bulgogi before.

**Sample presentation:** Bulgogi samples were prepared as mentioned above. Then, 40g of each sample was presented in an individual water bath (80°C) to maintain the sample at 63°C throughout the test. Bottled water (22±2°C) and cooked white rice (Haet-bahn, CJ Cheiljedang Corp., Seoul, Korea) were provided to cleanse the palate. The samples were coded with three-digit random numbers and were presented to the panelists side-by-side following Williams Latin Square design to prevent first-sample and order biases (16).

**Test procedure:** For the Korean panel, FP was conducted for five sessions, 1h per session, following the procedure suggested by Delarue and Shifferman (15), with some modifications as follows: Because the panelists were not trained, more sessions were given to facilitate panelists’ descriptor developments. In the first session, the panelists were introduced to the FP procedure. In the next two sessions, the panelists were exposed to bulgogi samples and developed their own descriptors individually. Selected descriptors were shared and each panelist modified their lists by adding terms from the lists of shared terms or replacing their own terms with that from the list. After the panelists finalized their own list of descriptors, they practiced evaluating using ordinal scales. The main session was repeated twice. The panelists evaluated the samples in an attribute-by-attribute manner. The panelists were asked to rinse their mouth using water and cooked rice between testing the samples.

FP for the Japanese panel was performed the same manner as for the Korean panel. However, considering that the Japanese were less familiar with bulgogi, sessions for descriptor development and ranking practices were extended to 5 sessions. FP for each panel was conducted in each country’s language.

**Statistical analysis**: Each panelist’s ranking was converted into scores from 1 to 7 (1=weakest, 7=strongest) (15). If two or more samples were in the same rank, the average rank of identical samples was assigned to each. A multi-block data matrix was generated by compiling several sample (row)-by-attribute (column) sub-data matrices each representing individual panelists’ result. The data from two replications were compiled as separate sub-matrices in the multi-block data table. Multiple factor analysis (MFA; 13) was applied to identify consensual space from individual configurations (FactorMineR package (17)). The RV coefficients (RV) were calculated to measure the similarity between the Korean and the Japanese FP results, as well as between the first and the second replicates for each panelist to check reproducibility.

**Consumer liking test**

**Consumer panel:** A population of 100 healthy adults was recruited from the consumer pool of DACAD Japan Ltd. (Osaka, Japan). Recruitment criteria were identical to those for FP. A total of 102 Korean participants were recruited from on-campus and surrounding local communities of Kookmin University. Both Korean and Japanese consumers were matched for gender and age.

**Sample preparation:** Samples were prepared in the same manner as for the FP. Immediately after cooking, each sample was maintained in a thermos at 62±4°C. When requested by the panelists, 30 g of each sample was immediately served on a disposable white polypropylene plate labeled with a three-digit random code. Bottled water and cooked rice were provided to cleanse the palate.

**Evaluation procedure:** The panelists were asked to rate the overall liking and the liking for appearance, flavor, and texture using 15-point hedonic scales (1=dislike strongly, 15=like strongly). Saltiness, sweetness, umami, and soy sauce flavor were evaluated using 9-point just-about-right (JAR) scales (1=not strong enough, 9=too much strong). Additionally, familiarity and authenticity (7-point Likert scale) were rated. Authenticity in this study was defined as consumer perception of typical sensory characteristics of a food cooked in the traditional Korean way. Finally, demographic information and consumption behaviors were collected.

The samples were tasted in a monadic way, following Williams Latin Square design. The panelists were instructed to rinse their mouth using bottled water and cooked rice between testing the samples, while taking a break for 1 min between the samples. Korean consumer test was performed in an individual booth at