



Effects of awareness of a pre-preference-choice between two similar soups on the performance of the duo-trio test with preferred reference

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Introduction

Consumer discrimination test

- Measuring consumer's discriminability is required to test perceived similarity between products, and thus it might be important to have actual consumers to perform the sensory discrimination test.
- In literature, it was reported that the consumers' discriminability was improved when affective state of mind was involved. For consumer discrimination tests, the difference test design using more familiar and/or preferred sample by consumer as the constant reference, rather than balanced-reference may allow a more efficient information processing (Chae, Lee & Lee, 2010; Lee, 2010).

Approach to similarity test

- For business objectives such as reformulation and cost reduction in the situations when an original product is compared with other prototypes, similarity test can be more suitable than discrimination.

Objective

- In order to explore more suitable consumer discrimination method that can be used for sensory similarity test, the effects of the variations in task instructions on the performance of duo-trio tests providing the preferred one as reference, by pre-test of preference, were investigated.

The instruction variance for the duo-trio test were as follow ;

- duo-trio tests with balanced-reference mode, preceded by a same-different question with tasting two different sample products. This pre-test was designed in order to equalize the exposure of samples across all four different task instructions.
- providing the preferred one as reference, making consumers unaware of that the reference was their preferred one, preceded by blinded preference test.
- providing the preferred one as reference, making consumers aware of that the reference was their preferred one, preceded by blinded preference test.
- providing the preferred one as reference, making consumers aware of that the reference was their preferred one, preceded by preference test notifying consumers the product that they have chosen to prefer in the previous preference test.

Materials & Methods

Subjects

- 176 female students (age range: 20-29 yrs) at Ewha Womans University and Yonsei University in Seoul.

Stimuli

- Stimuli: Commercial corn cream soup (Ottogi Co. Ltd., Pyeongtaek, Gyeonggido, South Korea).
- Strong stimuli (S): 98.5 g of powder product and 1.5 g salt mixed with nine times boiled de-ionized water.
- Weak stimuli (W): 100 g of powder product with nine times boiled de-ionized water.
- All stimuli were served as 20 ml aliquots in 50 ml glass beakers (Dong sung science, Co. Ltd., Gyeonggido, Korea) and presented at 58.0±0.5 °C.

Data analysis

- Estimates of d' value based on standard beta-binomial model, assuming a comparison of distances strategy were computed to measure the performance of the sample of 176 judges using R-package sensR (Christensen & Brockhoff, 2011).

Experimental design

- Pre-test was performed duo-trio 12 set with balanced-reference mode. 6 set was allocated each of two sub-sessions. Between sub-session was allocated to 10 min break time.

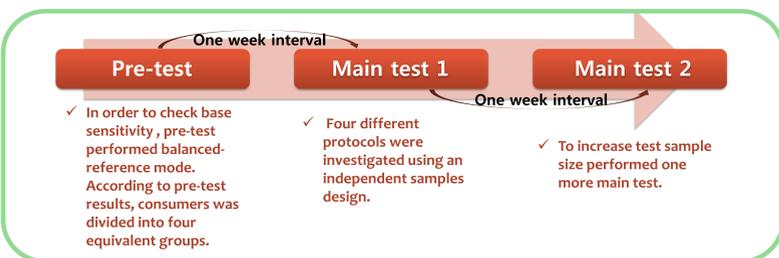


Figure 1. Procedure of pre-test and main test

- Group 1: Balanced-reference mode (control)
- Group 2: Unaware of that the reference was the preferred one
- Group 3: Aware of that the reference was the preferred one
- Group 4: Also, aware of the product chosen as the preferred one in the previous session

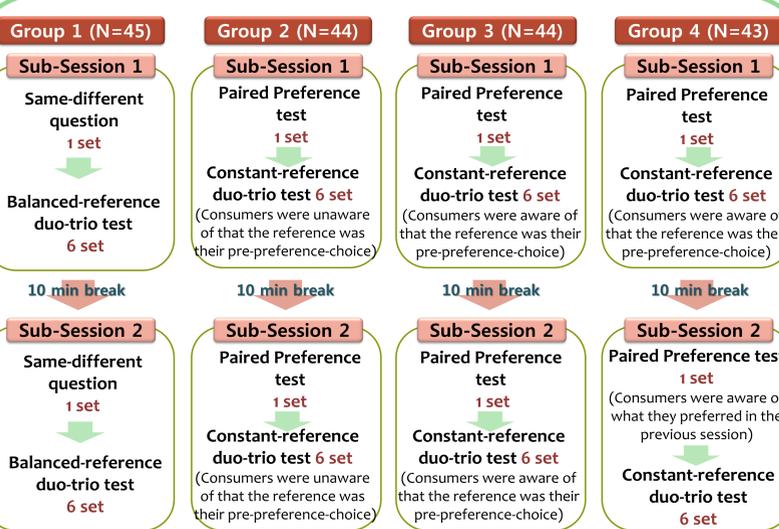


Figure 2. Experimental procedure of different four protocol in main test

Results

Group performance of four groups in pre-test and main test

Table 1. d' value (variance) of four possible stimuli presentation sequences in pre-test within each group

Group	d' (var) of each sequence for the pre-test				χ^2 -test, p-value (df=3)
	S sw	S ws	W ws	W sw	
Group 1	1.74 (0.059)	1.61 (0.057) ^{Aa}	1.39 (0.060) ^{Aa}	0.81 (0.127) ^{Aa}	$P=0.056$
Group 2	1.70 (0.056)	1.56 (0.077) ^{Aa}	1.25 (0.076) ^{Aa}	0.90 (0.123) ^{Aa}	$P=0.128$
Group 3	1.70 (0.056)	1.56 (0.066) ^{Aa}	1.47 (0.077) ^{Aa}	0.79 (0.170) ^{Aa}	$P=0.061$
Group 4	1.70 (0.058)	1.43 (0.062) ^{Aa}	1.43 (0.062) ^{Aa}	0.99 (0.087) ^{Aa}	$P=0.339$

- To investigate the effects of four different protocols, the test performance obtained from main-test was compared with that obtained from pre-test within each group (Table 2).

- The results indicate that only in group 2 and 4, the performances of main-test were significantly higher than those of pre-test ($p<0.05$). The group 4 showed highest increase in d' values.

Table 2. Comparison of increased d' value (variance) in four different duo-trio protocols

Test	Pre-test	Main-test
Group 1	1.39 (0.015) ^a	1.70 (0.012) ^b
Group 2	1.36 (0.015) ^a	1.82 (0.011) ^b
Group 3	1.40 (0.015) ^a	1.74 (0.019) ^a
Group 4	1.39 (0.016) ^a	2.00 (0.018) ^b

^{a,b} Values within the same row of same group are significantly different (χ^2 -test, $p<0.05$).

Group the performances of four different types of the duo-trio test using saltier-preferred-reference (strong reference) vs. less salty-preferred-reference (weak reference)

Table 3. d' value (variance) according to separated each reference in pre-test and main test

Reference	Pre-test	Main-test
	Strong stimulus (S)	
Group 1 (N=45)	1.67 (0.031) ^{aA}	1.61 (0.023) ^{aA}
Group 2 (N=42)	1.61 (0.035) ^{aA}	1.93 (0.015) ^{aAB}
Group 3 (N=40)	1.57 (0.035) ^{aA}	2.01 (0.026) ^{aAB}
Group 4 (N=42)	1.54 (0.030) ^{aA}	2.31 (0.033) ^{bB}
Weak stimulus (W)		
Group 1 (N=45)	1.11 (0.041) ^{aA}	1.80 (0.026) ^{bA}
Group 2 (N=35)	1.12 (0.067) ^{aA}	1.63 (0.050) ^{aA}
Group 3 (N=38)	1.03 (0.077) ^{aA}	1.31 (0.058) ^{aA}
Group 4 (N=30)	1.22 (0.050) ^{aA}	1.35 (0.038) ^{aA}

^{aA} Values within the same row not sharing a superscript letter are significantly different (χ^2 -test, $p<0.05$).
^{aA, bB} Values within the same column and the same nature of reference stimulus not sharing a superscript letter are significantly different (χ^2 -test, $p<0.05$).

- To confirm consistency of consumer's preference responses, consumers were divided according to the number of choosing strong stimulus (or weak stimulus) as the preferred stimulus during four preference tests. Consumers tended to prefer 'S' stimulus to 'W' stimulus (Table 4).

- In previous studies, it was reported that the test performance was increased when the reference was preferred stimulus or saltier one. Thus, the test performances were compared using only the tests in which the saltier (strong) stimulus used as the reference. When applying a similarity limit of $d'=1.5$ (proportion of discriminators, $p=0.33$), only the duo-trio test with balanced-reference mode indicated a significant similarity (Figure 3).

Table 4. The number of consumers corresponded to the frequency of choosing 'S' stimulus (or 'W' stimulus) as the preferred stimulus for four times of preference test

	S	Four	Three	Two	One	Zero
	W	Zero	One	Two	Three	Four
Group 2 (N=44)	9	8	19	6	2	
Group 3 (N=44)	6	11	18	5	4	
Group 4 (N=43)	13	14	10	5	1	

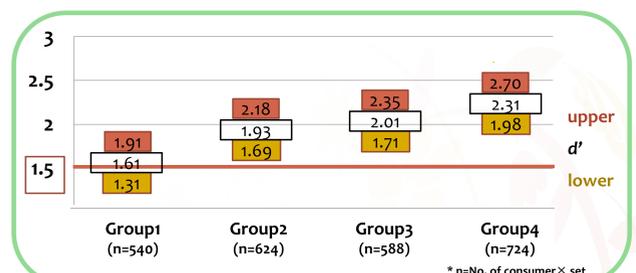


Figure 3. Comparing with d' value, lower and upper values of each group in main test (at 95% confidence interval); only saltier stimulus reference

Conclusions

- Consumers showed tendency to prefer sample with higher salt content.
- Group 4 who performed duo-trio test providing the preferred stimulus as reference with awareness of that not only the reference was their preferred one but also which stimulus was the preferred one in previous preference test, showed highest increase of d' value. It seemed to improve of consumers' discriminability by effect of awareness of a pre-preference-choice
- When comparing performance of only the tests in which the saltier sample was used as the reference, only the duo-trio test with balanced-reference mode indicated a significant similarity.
- These results imply that when the consumer discrimination method is not involving consumers' affects towards the samples, there is a potential risk to induce a wrong conclusion for a similarity test. Therefore consumer's affects and awareness to the sensory properties of foods may be important components that should not be separated from the perceived sensory difference.

Reference

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