



Understanding young immigrant Chinese consumers' freshness perceptions of orange juices: A study based on concept evaluation



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ABSTRACT

Freshness is a multidimensional attribute commonly encountered in everyday life and particularly in association with food. It awakens certain expectations from consumers, as it is a critical variable that affects the food quality and acceptability. The aim of this research was to identify sensory and non-sensory factors contributing to young immigrant Chinese consumers' freshness perceptions of orange juices. Two focus groups were undertaken, where participants ($n = 19$) evaluated freshness of 20 orange juices and their corresponding packages. The qualitative data from these focus groups was combined with the results from a wide-ranging review of existing literature on orange juice characteristics as well as related consumers' perceptions. From this, a set of 60 statements was derived with the purpose of representing the whole spectrum of possible viewpoints that young immigrant Chinese consumers might have about freshness. To obtain a holistic understanding of freshness, these statements were then used for subsequent sorting exercises using Napping and Q methodology ($n = 20$). Results showed that perceived freshness was related to an overall notion of healthy and natural. The young immigrant Chinese consumers defined freshness as a level of closeness to the orange, perceiving orange-like sensory qualities as fresh. Results also showed that freshness perceptions were greatly influenced by non-sensory attributes. Three distinct consumer perspectives were identified, with consumers in each of these perspectives holding homogeneous viewpoints about freshness. The new insights obtained from this research are important for food companies in determining long-term new product developments and in developing the marketing mix for products that are marketed on the freshness attribute.

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1. Introduction

Ranking sixth in the world in terms of consumption of orange juice, China creates tremendous opportunities for Western beverage manufacturers to develop value-added orange juice products that satisfy Chinese consumers' needs. Chinese consumers have been shown to place great importance on the attribute "freshness" when buying orange juice products (Chen & Gao, 2013). Freshness is a multidimensional attribute and its perception appears to be affected by a number of sensory and non-sensory characteristics. While the term is well described in the sensory literature, this literature is Western-centric and there is clearly a paucity of data on what Chinese consumers mean when they refer to the word "fresh". Distinct differences between Chinese and Western consumers in their attitudes towards and perceptions of freshness make entering the Chinese market a challenge for exporters. To successfully develop and market orange juice products in China,

it is therefore necessary to understand the definition of, factors contributing to, and the concept of, freshness in the specific context of orange juices consumption from Chinese consumers' perspectives. The purpose of the present investigation was to develop an in-depth and holistic understanding of the sensory and non-sensory factors contributing to young immigrant Chinese consumers' freshness perceptions of orange juice products. Young Chinese consumers were selected as the study population for this investigation since they have been reported in literature to be the segment of consumers in China who most often consume fruit juices, who are more likely to be health conscious and who have a higher interest in purchasing orange juice products (Chen & Gao, 2013). To understand consumers' freshness perceptions, two different, but interrelated studies, were conducted with young immigrant Chinese consumers residing in New Zealand.

1.1. Consumers' perceptions of freshness

Freshness perception is not easily described, particularly as it is a complex and challenging concept varying from one product type

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to another. It may well be argued that the only meaning of freshness that matters is the one used by consumers. In a very real sense, consumers are the ultimate arbiter of what constitutes freshness in a food product, because it is only their perceptions of freshness that determines food perception, purchase behaviour and food preference (Cardello & Schutz, 2003). Several studies have been carried out to investigate the definition of the concept of freshness from a consumer perspective (Cardello & Schutz, 2003; Fillion & Kilcast, 2000; Heiss, 1986; Péneau, Linke, Escher, & Nuessli, 2009; Schwerdtfeger, 1979). For example, Cardello and Schutz (2003) demonstrated that the consumers perceived the foods that were described as “minimally processed” (e.g. high pressure or pulsed electric fields) as less fresh than refrigerated or frozen foods. Fillion and Kilcast (2000) reflect that the requirement for products is “close to original form” for both sensory properties and time from manufacturing date. Heiss (1986) suggested “fresh” is the equivalent to good, healthy or natural while “industrially treated” would correspond to an inferior value, denatured or artificial.

The sensory properties of products, in terms of appearance, odour, flavour and texture, without doubt contribute strongly to consumer freshness perception. Several attempts have been made to identify the sensory characteristics of food products that consumers associate with the attribute freshness (Rega, Fournier, Nicklaus, & Guichard, 2004; Baldwin et al., 2012). Furthermore, many studies have demonstrated that the non-sensory characteristics could potentially affect freshness perceptions of consumers (Lotong, Chambers, & Chambers, 2003; Kim, House, & Gao, 2012). Although there is a large body of literature, it is almost exclusively Western-centric and there is very limited evidence regarding the understanding of what this subjective concept means to Chinese consumers.

1.2. Measurement of consumers' freshness perceptions

Perceived freshness is complex because it involves interactions of sensory sensations with non-sensory attributes. Further complicating the measurement of this subjective concept is the fact that different consumers are likely to associate different sensory characteristics with perceived freshness (Heenan, Hamid, Dufour, Harvey, & Delahunty, 2008). Several methodologies can be used for evaluating the degree of freshness. Rating is one of the commonly used methodologies (Péneau, Brockhoff, Hoehn, Escher, & Nuessli, 2007). Rating can determine the degree of freshness of different attributes of a food. However, this approach implies little reflection by consumers on what they consider is the most important attribute for freshness. It has been suggested that the meaning of freshness varies according to the background of the person who gives the definition (Cardello & Schutz, 2003). Therefore, it is conceivable that consumers base their evaluation on specific features of food products that they consider to be important to freshness. In this regard, multidimensional data analysis techniques have been commonly applied to investigate the complex consumer perceptions and their sensory drivers (Carr, Craig-Petsinger, & Hadlich, 2001). In particular, a number of studies used descriptive sensory analysis in parallel with freshness rating to determine the relationship between sensory qualities defined by a trained panel and individual consumer perceptions (Heenan et al., 2008; Péneau et al., 2007). However, sensory attributes defined by a trained sensory panel cannot represent the viewpoints of consumers. To address the methodological gap, the present study employed Napping (bi-dimensional task) to explore the multidimensional attribute (freshness), and in an innovative methodological extension to this, Q methodology, which has been used extensively in the wider social sciences to study subjectivity, was used to enhance the bi-dimensional map (derived from Napping) by identifying consumer segments.

Projective mapping is one of the novel methodologies for sensory characterization, which as a tool for linking sensory analysis to consumer research. Napping (a special sub-case of projective mapping) provides information about the overall similarity and dissimilarity amongst a set of products by collecting a bi-dimensional map from a group of participants in a single session (Risvik, Mcewan, Colwill, Rogers, & Lyon, 1994). Participants are asked to taste the samples and afterwards allocate them on a sheet of paper according to their similarities and differences using their own criteria. Combined with Ultra Flash Profiling (UFP), participants were asked to enrich their Napping map by writing down any terms they found appropriate to describe each sample or groups of samples (Pagès, 2005). The main advantage of Napping is that it provides a holistic judgement about the sensory characteristic of samples, which is similar to the way in which consumers usually evaluate products (Vicente, Varela, Saldamando, & Ares, 2014). While Napping has been used primarily to characterize the product differences and consumer liking based on the sensory qualities, it is not commonly used to measure consumers' perceptions of subjective concepts such as freshness. Cluster analysis is commonly conducted to determine consumer segments based on the freshness map and enhances the understanding by indicating that freshness perception varied amongst consumers (Heenan et al., 2008). There is an alternative, and arguably better, method to derive clusters or segments of commonly held perspectives on a subjective issue like freshness: Q methodology.

Q methodology is an effective tool to extract subjective viewpoints extant amongst a group of participants and allows those viewpoints to be understood holistically and to a high level of qualitative detail (Watts & Stenner, 2005). Q methodology combines the strengths of qualitative and quantitative paradigms (Baker, Thompson, & Mannion, 2006; Brown, 1996; Cross, 2005). According to Watts and Stenner (2014), the qualitative aspect of Q methodology is grounded in its ability to emphasize how and why people think the way they do. On the other hand, the quantitative aspect involves using factor analysis techniques as a means for grouping like-minded individuals. Q method is intended to systematically elicit individual perspectives and to group them into shared perspectives (Watts & Stenner, 2014). Participants express their viewpoints through their Q sorts (each participant's distribution of the statements is known as a Q sort). The Q sorting procedure requires participants to read statements related to the research topic and then to rank-order these statements from strongly agree to strongly disagree (Brown, 1996). A post-sort interview is conducted to obtain more meaningful qualitative data from participants based on their Q sorts.

2. Research design

The research comprises two studies: focus groups (Study one) and two sorting activities (Napping and Q method) using statement cards (Study two). In the first study, two focus groups (each with 9–10 participants) were conducted to collect primary data on sensory and non-sensory factors contributing to young immigrant Chinese consumers' freshness perceptions of orange juice products. These data allowed researchers to generate statements for subsequent Napping and Q method sorting activities. The reason for collecting primary data at this stage by running focus groups was that there is limited literature that has focused specifically on freshness perception from a Chinese consumer's perspective. Thus, the purpose of the focus groups was primarily to ensure that the researchers were confidently able to devise a set of statements about freshness that adequately reflected the salient issues to the specific target population (i.e. young immigrant Chinese consumers). Given a set of statements that represented the whole

spectrum of viewpoints towards freshness, in the second study, two sorting activities (Napping and Q method) with 20 different participants were carried out to improve the understanding of what constitutes orange juice freshness based on the set of text statements. The purpose of using the Napping method was to determine relationships between sensory and non-sensory characteristics and consumer freshness perceptions. The purpose of using the Q method was to enhance the understanding of the concept of freshness by capturing a range of shared dominant viewpoints about freshness.

Twenty orange juices were selected from different orange juices that consisted of both freshly hand squeezed ($n = 1$) and commercially branded ($n = 19$) varieties currently available in the New Zealand market. The fresh juice was squeezed using a fruit juicer two hours prior to study. The oranges chosen for this study were the only commercially available oranges on the market at the time of study (August). The variety was New Zealand seedless (Navel). All samples were selected based on differences in the major ingredient components (fresh orange, squeezed orange juice, orange juice from concentrate, natural/artificial orange flavour), sensory properties (colour, texture, flavour, pulp/no pulp), storage conditions, container types, shelf life, pack sizes and prices as shown in Table 1. Variations within these sensory and non-sensory

characteristics that potentially influenced consumers' freshness perceptions ensured that all participants would be able to feel that they could express their opinions through the 20 orange juices.

Recruitment of participants was achieved by advertising on notice boards and supermarkets. Interested individuals were emailed a screening questionnaire. Participants were recruited on the basis that they are Mandarin speakers, they regularly consumed orange juice products (i.e. more than once in the past three months), had lived in New Zealand for a period of two years or shorter, as well as had no known allergies to any orange beverages. As the recruitment progressed, further participants were recruited through 'snowball' and 'word-of-mouth' processes. Participants selected in this research were allocated to Study one (focus groups) or Study two (sorting activities) depending on their availability. Each participant received a NZ\$10 supermarket voucher for reimbursement towards costs involved in travelling to the research centre. Ethical approval to complete the research was granted by the University of Otago Human Ethics Committee (13/259). All research was conducted in Mandarin by a native Mandarin speaker. All research tools were translated initially by the researcher, and then back translated into English by a second native Mandarin speaker not involved with the project to ensure accuracy in content and in meaning.

Table 1
Orange juice samples selected in this research.

Sample	Processing type	Ingredients	Storage condition (temperature)	Pulp/no pulp	Container type	Shelf life	Price (\$)/100 ml	Pack size (ml)
OJ 1	Pasteurized concentrated	Reconstituted orange juice (100%), flavour, vitamin C	Room	No	Paper carton	<5 days once open	0.36	1000
OJ 2	Pasteurized concentrated	Orange juice from concentrate (16%), sugar, citrus pulp (5%), food acids (330, 331), flavour, antioxidant (300)	Room	Yes	Plastic	6 months	0.17	3000
OJ 3	High pressure processing	Squeezed orange juice	Refrigerated	Yes	Opaque plastic	2–3 weeks	0.40	1000
OJ 4	Pasteurized fresh squeezed	Squeezed orange juice	Refrigerated	Yes	Opaque plastic	2–3 weeks	0.25	2000
OJ 5	Pasteurized fresh squeezed	Squeezed orange juice, vitamin C	Room	No	Paper carton	6 months	0.35	1000
OJ 6	Pasteurized concentrated	Orange juice from concentrate (99.9%), vitamin C, flavour	Room	No	Plastic	6 months	0.20	2400
OJ 7	Spray drying	Sugar, acidity regulator, flavour, antioxidant, natural colours, clouding agent, natural sweetener	Room	No	Paper	6 months	\$2.70/5pk	5pk
OJ 8	High pressure processing	Squeezed orange juice	Refrigerated	Yes	Opaque plastic	2–3 weeks	0.40	1000
OJ 9	Pasteurized concentrated	Reconstituted orange juice (43%), vitamin C, pulp (2%)	Room	No	Paper carton	6 months	0.29	1000
OJ 10	Pasteurized fresh squeezed	Orange juice (98.4%) (squeezed orange juice, reconstituted orange juice, orange pulp), sugar, preservative	Refrigerated	Yes	Plastic	<5 days once open	0.67	600
OJ 11	Pasteurized concentrated	Organic orange juice (from concentrate)	Room	No	Packaged Juice pouch	6 months	1.24	200
OJ 12	Spray drying	Sugar, acidity regulator, flavours, antioxidant, colours, clouding agent, vegetable gum	Room	No	Paper	6 months	\$0.99/3pk	3pk
OJ 13	Spray drying	Food acid, sodium chloride, flavour, colour	Refrigerated	No	Plastic	6 months	0.57	330
OJ 14	Pasteurized concentrated	100% Australia Valencia orange juice and vitamin C	Refrigerated	No	Glass	6 months	1.07	260
OJ 15	Pasteurized concentrated	Orange juice from concentrate, natural flavour	Room	No	Glass	6 months	0.81	750
OJ 16	Pasteurized concentrated	Reconstituted orange juice 56% fruit content, orange pulp 8%, sucrose, flavour, preservatives	Refrigerated	No	Plastic	7–8 weeks	0.29	1000
OJ 17	Pasteurized concentrated	Natural orange juice concentrate, orange flesh pieces, sugar, citric acid, vitamin C, orange flavour	Room	Yes	Canned	24 months	0.64	200
OJ 18	Spray drying	Organic orange juice (1%), natural orange flavour, organic lemon juice from concentrate	Refrigerated	No	Glass	6 months	0.66	330
OJ 19	Pasteurized fresh squeezed	Blend of squeezed juice and concentrate, preservative	Refrigerated	Yes	Plastic	2–3 weeks	0.4	2000
OJ 20	Untreated	Fresh orange	Refrigerated	Yes	Glass	2–3 days	1.16	600

3. Methods

3.1. Methodology used in Study one: focus groups

In the focus groups which each ran for approximately one and a half hours, nineteen participants (11 females and 8 males aged between 18 and 39 years) carried out two steps (a blind juice tasting and a package evaluation) both of which were conducted individually and then discussed with the wider group. In the first step, participants evaluated orange juice freshness based on the sensory properties (i.e. colour, smell, flavour, texture and after-taste). In the second step, participants evaluated freshness based on the non-sensory properties (i.e. packaging attributes, price, shelf life, storage condition) with orange juice package bottles only. The focus group sessions were audio recorded. The discussion generated in the two focus groups was very similar in nature and for this reason the decision was made that data saturation had been reached and no further focus groups were required. In terms of the analysis, from each step, a set of statement cards was derived from qualitative terms that participants' most associated with freshness in orange juices. Audio recordings were translated into English, back translated and then transcribed and coded. During the coding process, the researcher read transcripts and recognized recurring descriptors in the interviews using the coding function in the NVivo (version 10) software package. These descriptors were sensory or non-sensory related. After rereading transcripts, several categories were revealed. Once the categories were identified, the whole set of potential statements were written on a white board and categorized. Meanwhile, a number of statements obtained from a wide-ranging review of existing literature on orange juice characteristics as well as related consumers' perceptions were combined with the descriptors derived from the focus group discussions. After that, the final statement set was constructed by picking a given number of representative statements from each category. One of the key points of selecting statements was to make sure they covered both positive and negative responses to freshness.

3.2. Methodology used in Study two: Napping and Q method sorting activities

In order to deeply understand the range of perspectives that are held with relation to freshness, and to examine how sensory sensations interact with packaging attributes, different participants ($n = 20$, 15 females and 5 males aged between 18 and 39 years) carried out two sorting activities with statement cards. In the sorting activity, participants were asked to sort 60 statement cards using two methods, namely, Napping and Q methodology, based on their orange juice freshness perceptions. The sorting activity was carried out in person one-on-one in Mandarin during one week. To ensure a balanced order, ten participants first sorted the statements according to Napping and then did Q method sorting, while the order was reversed for the other ten participants. Twenty participants were considered the optimal number to complete study two. According to Stenner, Watts, and Worrell (2007), the ideal number of participants for Q method is a trade-off between two rules of thumb. The upper end is determined by the rule of having more statements than participants in a study, with an ideal ratio of 1:3. The lower end is set by the need to have enough Q sorts to adequately summarize the social perspectives through factor extraction. For each perspective, it is common to have at least three people load significantly on it in order to be able to adequately explain the detail of the perspective. Given that there were 60 statements, and working under the assumption that a three or four factor solution would be obtained in the analysis, the ideal range of

participant numbers was 9–20. The upper maximum number of participants was selected in order to capture as wide a range of opinions as possible about orange juice freshness. Furthermore, 20 participants provided an appropriate sample size for the Napping activity as the literature shows that between 1994 and 2013, 63% of Napping studies worked with 20 or fewer participants (Vidal et al., 2014).

3.2.1. Napping sorting activity

During the Napping sorting, participants were given a set of statement cards ($n = 60$) and a 840 mm × 594 mm sheet of white paper. Participants were instructed to arrange the statement cards on the paper according to how similar or dissimilar in freshness. The more similar the statements are in freshness, the closer they should be positioned to each other and the more dissimilar the statements are in freshness they should be positioned further apart. When the discriminative task was finished, Napping was combined with a UFP task. Participants were instructed to write down the descriptors to explain the differences amongst the statements. At the end, participants were expected to write down either “fresh” or “not fresh” near the position of each group based on their freshness perceptions.

For the statistical analysis, a Multiple Factor Analysis (MFA) was performed on the Napping data. During data collection, the X and Y coordinates of each statement was measured in millimetres using a ruler, where each statement position was measured from the bottom left corner to the centre of the statement. These data were entered into Microsoft Excel (2010) as X and Y coordinates for each participant. Meanwhile, the descriptors that participants used to organize the statements were added as a supplementary table next to the X and Y coordinates table. Similar terms given by different participants were combined into one. An MFA (XLSTAT, 2013) was performed on the data; the output configuration was produced to indicate the differences and similarities between the 60 statement cards in freshness.

3.2.2. Q method sorting activity

During the Q sorting task, participants were provided a Q sort distribution map (Fig. 1). They were required to allocate each statement a ranking position within the sorting distribution provided based on how fresh they considered each statement to be. The more they perceived each as fresh, the higher the ranking they awarded it. Participants were instructed to complete the task in a series of steps. Firstly, they sorted 60 statements into three piles based on respective freshness. Pile 1 included those statements that they considered definitely to be fresh. Pile 2 included those not fresh statements and Pile 3 included those statements, that they felt unsure or neutral. They were asked to assign a fixed number of statements to each of the Q sort scoring values, ranging from most fresh (+5) to most not fresh (−5) in the distribution map. All samples could be moved around in the sort at any time until they were satisfied with the sorting. At the end of sorting activity, a 10–15 min post-sorting interview was conducted. In this follow-up interview, they were asked to comment on why they ranked statements as +5, −5, +4, −4, +3 and −3. The interviews were audio recorded, translated into English and then transcribed by the researcher.

Data analysis in Q methodology typically involves correlation, generation of the factors and factor interpretation. Factors actually are Q sorts, which are called “idealized sorts”, and are considered to be shared or common viewpoints around the topic that have been extracted from the whole participant population (Watts & Stenner, 2014). A free programme (PQMethod version 2.35) was used for the factor analysis (Page, 2002). In Q methodology, there are no firm rules on how many factors should be extracted from the analysis, rather the researchers are responsible for making the decision of how many factors should be kept on the basis of

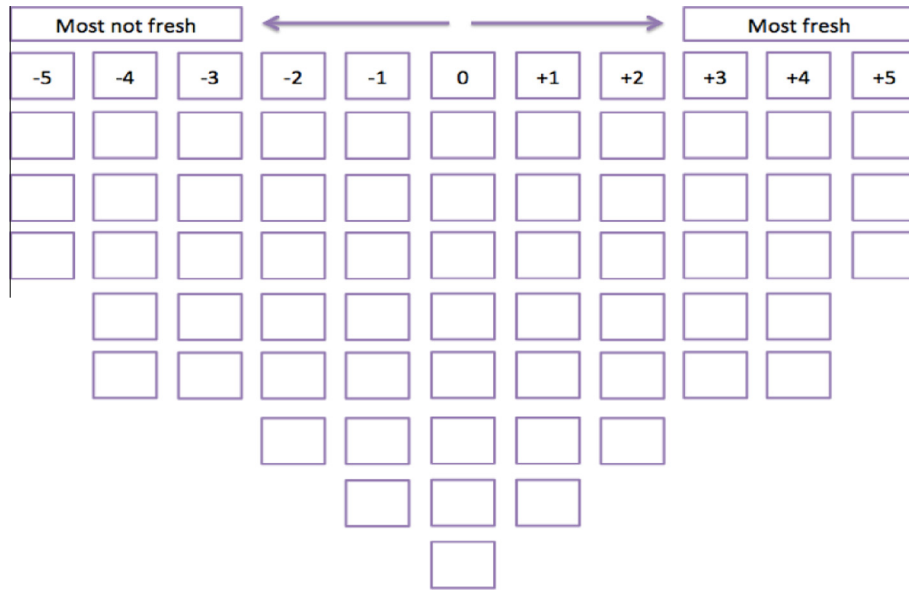


Fig. 1. Q sort distribution map.

the purpose of research. During the factor interpretation, the job of the researchers is to read the single Q sorts and write a narrative describing each perspective (Watts & Stenner, 2014).

4. Results

4.1. Results of Study one: statement cards selected for sorting activities

According to the standard, a Q set (a set of statements for Q method) of somewhere between 40 and 80 statements is recommended (Watts & Stenner, 2014). A final set of 60 statements (Table 2) was selected from the original 88 statements that were drawn from both focus group discussions and literature. Care was taken to cover as wide a range of immigrant Chinese consumers' viewpoints towards freshness as possible. As well as the English translation, the table also includes the original terms that were employed by participants. A sense of the breadth of views and the important areas of contention were selected both in sensory and non-sensory characteristics. During the selection process, the original statements were coded into thirteen identified categories evident within the concurrence of statements about freshness. They were colour, taste, smell, texture, aftertaste, flavour, price, labelling, shelf life, package attributes, the amount of information, purchase location and others. Those overlapping statements were removed firstly, and those that contributed an original contribution to the statements were selected. The aim was to have a balance of statements that included sensory-related, non-sensory-related, positive responses to freshness and negative responses. The pilot studies were carried out with Chinese participants before formal sorting activities to clarify the wording of individual statements, to reduce the duplication in the statement set, and to generate new statements if it was found that some viewpoints had not been included.

4.2. Results of Study two: Napping and Q method sorting activities

4.2.1. Napping sorting activity

The consensus product map (Fig. 2) shows how participants perceived the statement cards based on freshness perception relative to each other on an overall level. A total of 31.84% of the variance was explained in the first two factors. Based on the

distribution of statement cards in this study, participants strongly agreed that “not from concentrate”, “freshly squeezed juice”, “no preservatives”, “no added sugar”, “organic”, “cold pasteurization”, juicy pulp, squeezed orange juice flavour, pulpy, glass bottle, purchased in farmers’ market, short shelf life, transparent package, much information on labelling, with tinfoil lid, stored in refrigerator, well-known brand, small pack and high price located on the negative axis of factor 1, were “fresh”. While the statements “orange flavour drink”, cooked flavour, fermented flavour, rotten flavour, additives flavour, mixed fruit flavour, sweet aftertaste, dilute, fizzy, added essence smell, sweet, bright orange colour, floating pulp, transparent colour, not much information on labelling, long shelf life, white opaque bottle, canned, powdered orange juice and low price positioned on the positive axis of factor 1 were “not fresh”. Along the factor 2 axis, the statements large pack, plastic bottle, purchased in vending machine, orange colour package, carton box and purchased in food court and “heat pasteurization” were highly loaded on the negative end of the factor 2 and described as “neither fresh nor not fresh” by participants. As opposed to the negative side of the plot, the statements bitter, bitter aftertaste, astringent, thick texture, sediment, foamy, dark orange colour and viscous texture were positioned on the positive side of the plot, which means the way that participants perceived these statements was different, with a large variance in how participants perceived these statements.

4.2.2. Q method sorting activity

A three-factor solution was retained that represented the participants' viewpoints in relation to the freshness concept (Table 3). They were named as ‘sensory properties-driven consumers’, ‘pulp lover’ and ‘packaging information-driven consumers’ and together explained 63% of the variance. Sixteen participants from the participant group of 20 loaded significantly onto one of the factors. The initial significant factor loading at the 1% level was 0.33, but this resulted in a lot of confounded sorts (meaning that Q sorts loaded significantly on more than one factor). Hence, based on the suggestions from the Q methodology guidebook (Brown, 1980), the significant factor loading was increased from 0.33 to 0.55 in order to ensure each significant loading was meaningful and important. Correlations between factors varied from 0.61 to 0.75. All factors were positively correlated. This means a great deal of overlap existed across the three factors. The strongest correlation for the

Table 2
Sorting activity statement cards ($n = 60$). English translation and corresponding original terms in the participants' own words.

No.	Statement (English)	Original terms (Chinese)	No.	Statement (English)	Original terms (Chinese)
1	High price	价格贵的	31	Purchased in farmers' market	早市购买的
2	Low price	价格便宜	32	Orange colour	橙子颜色的
3	"Orange flavour drink"	"橙汁味饮品"	33	Bright orange colour	明亮的橙色
4	"Organic"	"有机的"	34	Transparent colour	透明度高的橙色
5	"Not from concentrate"	"非浓缩果汁"	35	Dark orange colour	暗橙色
6	"Freshly squeezed juice"	"鲜榨的果汁"	36	Astringent	涩的
7	"No added sugar"	"不添加糖的"	37	Sweet	甜的
8	"No preservatives"	"不含防腐剂的"	38	Sour	酸的
9	"Heat pasteurization"	"热巴氏消毒法"	39	Bitter	苦的
10	"Cold pasteurization"	"冷巴氏消毒法"	40	Cooked flavour	煮过的味道
11	Short shelf life	保质期短的	41	Orange peel flavour	橙子皮的味道
12	Long shelf life	保质期长的	42	Fermented flavour	发酵的味道
13	White opaque bottle	白色不透明包装的	43	Rotten flavour	腐烂的味道
14	Canned	罐装的	44	Squeezed orange juice flavour	鲜榨橙汁的味道
15	Glass bottle	玻璃瓶包装的	45	Mixed fruit flavour	混合水果的味道
16	Plastic bottle	塑料瓶包装的	46	Additives flavour	有添加剂的味道
17	Carton box	纸盒包装的	47	Juicy pulp	多汁的果粒
18	With tinfoil lid	有锡纸包装盖的	48	Sediment	有沉淀的
19	Small pack	小盒包装	49	Pulpy	有果粒的
20	Large pack	大盒包装	50	Thick texture	浓稠的果汁
21	Stored in refrigerator	需要放冰箱里保存的	51	Dilute	稀的
22	Powdered orange juice	速溶的橙汁	52	Foamy	带泡沫的橙汁
23	Transparent package	透明包装的	53	Fizzy	有气泡的
24	Exquisite package	精致包装的	54	Uniformly distributed pulp	果粒充满果汁的
25	Well-known brand	知名品牌的	55	Added essence smell	有香精的气味
26	Not much information on labelling	包装上信息不多的	56	Bitter aftertaste	后味是苦的
27	Much information on labelling	包装上信息全面的	57	Sweet aftertaste	后味是甜的
28	Purchased in supermarket	超市购买的	58	Viscous texture	有点黏稠的
29	Purchased in food court	饮食区购买的	59	Floating pulp	悬浮的果粒
30	Purchased in vending machine	自动售货机购买的	60	Orange colour package	橙色包装的

three factors was between factor 1 and 3, which correlated positively at 0.75. This high degree of correlation does indicate that there is a shared level of cultural consensus (Romney, Weller, & Batchelder, 1986) amongst this study population as to what the concept of fresh means in this particular context. Although the correlations between the three factors were high, it is still possible and useful to interpret correlated factors (Sommerstein, 2014) and as such the researchers accepted this three-factor solution and then

progressed onto interpreting the important differences amongst these factors. The summary interpretation of each factor presents below. When referring to a particular statement (this is displayed in italics), the statement number is given in brackets followed by its rank order value.

Factor 1: 'sensory properties-driven consumers' (Eigenvalue = 10.4, explained 24% study variance). 'Sensory properties-driven consumers' constituted a group of people who mainly focused on sensory qualities of orange juice when evaluating freshness. Their freshness perceptions were less influenced by packaging design (i.e. container material, appearance and size) because such attributes were seen as a marketing gimmick, rather than a way of giving consumers meaningful information. As one participant put it,

"... My freshness perception is mostly influenced by taste, colour and texture. As for the extrinsic factors, for example, package-based characteristics, are not important to me because I do not trust advertising and claims on food that saying is good for health"

[(Participant 2, female)]

From this perspective, this group regarded sensory characteristics as the best tool at their disposal for their judging orange juice freshness. Members of this group believed that freshness defined a level of closeness to original orange fruit. For this reason participants placed the statements that related to sensory qualities higher than others. For instance, *bitter aftertaste* (56: +5), *orange peel flavour* (41: +5), *stringent* (36: +4), *sour* (38: +3), *bitter* (39: +3), *foamy* (52: +2) and *orange colour* (32: +1) were highly mentioned by participants, receiving higher freshness ranking scores. In addition, 'sensory properties-driven consumers' often associated natural with freshness. Their natural concept was reinforced not only by orange-like qualities, but also by the amount of natural ingredients. Participants embracing the natural value expressed the desire for fewer preservatives, artificial colouring and sweeteners. In this sense, members in this factor strongly disagreed that the statements *additives flavour* (46: -5), *added essence smell* (55: -4) and *powdered orange juice* (22: -4) were fresh. What is more, the statement *glass bottle* (15: +4), *short shelf life* (1: +5) and *purchased in farmers' market* (31: +3) were closely related to health, safety and high quality. In short, participants holding this viewpoint highly valued the orange-like sensory qualities of fresh juice and largely distrusted marketing gimmicks promoting freshness.

Factor 2: 'pulp lover' (Eigenvalue = 1.3, explained 23% study variance). 'Pulp lover' consumers placed the largest importance on the juice containing pulp and ranked positively all of the statements related to pulp: *juicy pulp* (47: +5), *uniformly distributed pulp* (54: +5), *pulpy* (49: +4) and *floating pulp* (59: +2). They believed that the amount of pulp increased the juice's freshness because it more closely resembled freshly hand-squeezed juice. This account of freshness concept shared similar viewpoints to 'sensory properties-driven consumers' where participants perceived untreated juices or close to the orange-like qualities as fresh. In this sense, they shared similar sensory drivers for freshness in terms of *squeezed orange juice flavour* (44: +4), *orange colour* (32: +2) and *orange peel flavour* (41: +1). However, in contrast to 'sensory properties-driven consumers', 'pulp lover' was distinguished by the sensory drivers and included *bitter* (39: -4), *bitter aftertaste* (56: -3), *foamy* (52: -2), *stringency* (36: -2) and *sediment* (48: -2). This difference could be explained by the variation in the participants' perception of fresh orange. On the other hand, this group was strongly influenced by non-sensory qualities. *Short shelf life* (11: +4) is an important attribute that participants highly valued and those related statements, including *purchased in farmers' market* (31: +4) and *stored in refrigerator* (21: +4) were assigned a positive ranking score. Packaging attributes, such as claims on

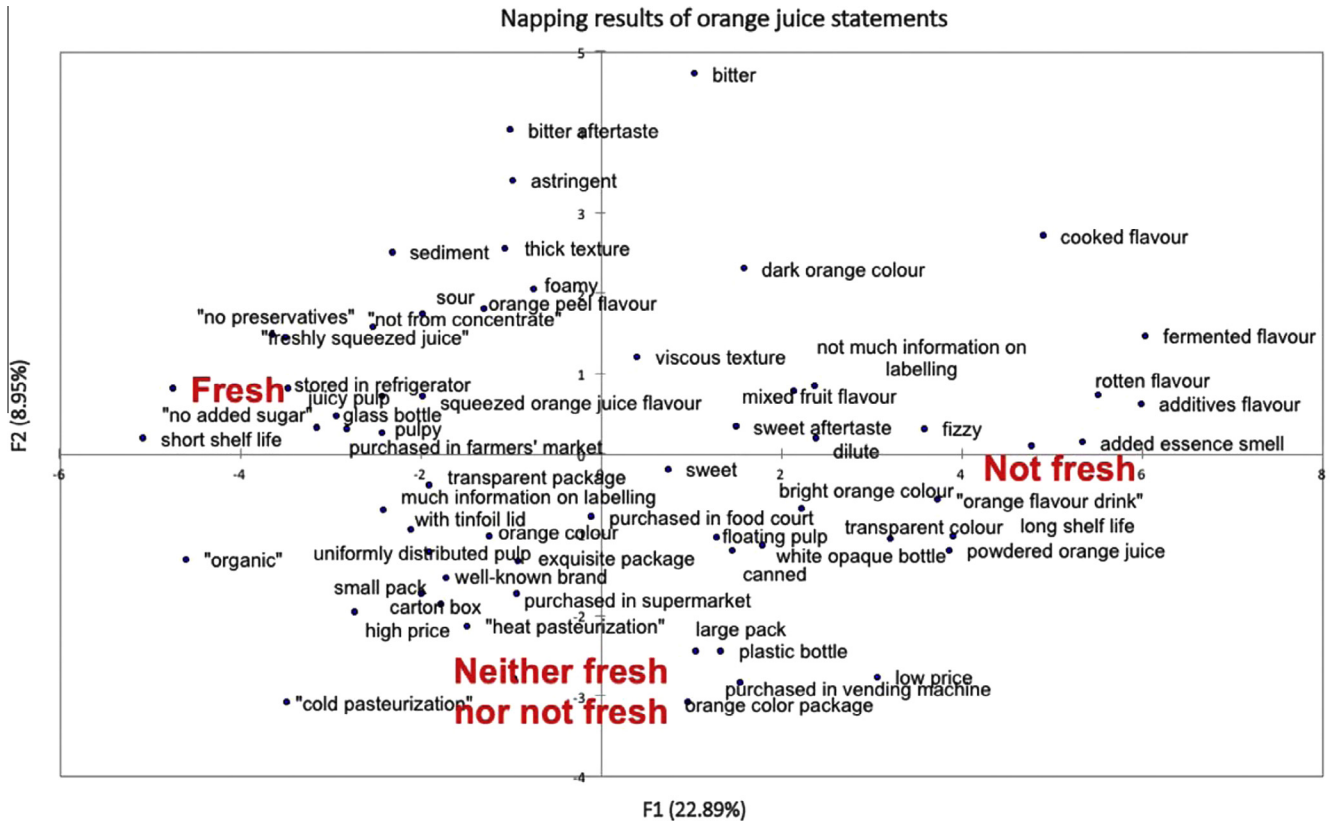


Fig. 2. Representation of the orange juice statements ($n = 60$) and the terms used to describe the statements, in the first and second dimensions of the MFA of data from Napping.

Table 3
Table shows manual flagging of factor loadings. Those sorts that loaded onto a factor at the significance level of 0.55 to two decimal places were flagged (marked with an “X”). Significant loadings are displayed in bold.

	Factor 1	Factor 2	Factor 3
Participant 1	0.2487	0.6824X	0.4253
Participant 2	0.8356X	0.0779	0.3461
Participant 3	0.6804X	0.2378	0.1776
Participant 4	0.0994	0.6944X	0.4048
Participant 5	0.5234	0.2670	0.4656
Participant 6	0.5938X	0.4949	0.1579
Participant 7	0.6842X	0.3016	0.2072
Participant 8	0.3484	0.4786	0.4369
Participant 9	0.2403	0.2491	0.6310X
Participant 10	0.4018	0.6463X	0.3124
Participant 11	0.2805	0.4339	0.5880X
Participant 12	0.5879X	0.2941	0.3634
Participant 13	0.5201	0.3237	0.6294X
Participant 14	0.1274	0.7609X	0.2540
Participant 15	0.5064	0.4488	0.4758
Participant 16	0.5424	0.1816	0.5823X
Participant 17	0.2292	0.4515	0.4515
Participant 18	0.3136	0.6777X	0.0916
Participant 19	0.6409X	0.2326	0.2446
Participant 20	0.4617	0.6980X	0.1782
Eigenvalues	10.4223	1.3341	0.6986
Variance (%)	24	23	16
Total variance (%)			63

the package, were perceived as having an important role in helping people to make freshness judgements. Moreover, statements *glass bottle* (15: +3), *transparent package* (23: +2), *high price* (1: +2) and *much information on labelling* (27: +3) were perceived in a positive way.

“Package transparency is important to me because I can see the orange juice’s colour and texture through the bottle”
 [(Participant 1, female)]

In short, ‘pulp lover’ consumers were people who filled the middle ground between the other two factors: ‘sensory properties-driven consumers’ and ‘packaging information-driven consumers’. The fact that fresh juice contains pulp was far more important than all other possible attributes in determining a beverage’s freshness status.

Factor 3: ‘packaging information-driven consumers’ (Eigenvalue = 0.7, explained 16% study variance). As the name suggests, ‘packaging information-driven consumers’ constituted a group of people who were mainly concerned about packaging design, processing type, brand, information on labelling and price. They placed the least importance on sensory qualities such as taste, flavour, colour, texture, aftertaste and the presence of pulp. One participant explained the reason for this value by saying,

“I think sensory perception depends on persons, it varies from individual to individual, so it is hard to perceive freshness using sensory characteristics”
 [(Participant 11, female)]

Like the ‘pulp lover’, *much information on labelling* (27: +5) was very important to participants, as was the proxy of high quality and freshness. What is more, consumers were particularly concerned about shelf life, perceiving *short shelf life* (11: +5) as fresh, as well as information on the packages, such as “*organic*” (4: +4), “*no preservatives*” (8: +4), “*not from concentrate*” (5: +3) and “*no added sugar*” (7: +2). They strongly agreed with the price-quality relationship. *High price* (1: +5) received the highest freshness ranking score amongst participants holding this viewpoint. They also

perceived *well-known brand* (25: +3) as a means to guarantee the freshness. When asked the reason for this, one participant explained this by saying,

"I believe that well-known food companies are willing to invest in equipment, facilities, and more likely to follow the food safety standard to assure the quality of food products"

[(Participant 9, female)]

It is noteworthy that participants in this group assigned a certain importance to processing type, perceiving such information as a claim that food companies used to guarantee its safety. "*Cold pasteurization*" (10: +3) was perceived as fresher than "*heat pasteurization*" (9: +2). Furthermore, participants also acknowledged package material and purchase location as an effective means of ensuring a fresh orange juice, regarding *with tinfoil lid* (18: +3), *carton box* (17: +2), *glass bottle* (15: +1) and *purchased in farmers' market* (31: +4), as well as *purchased in supermarket* (28: +1), as fresh. Consistent with the viewpoints of other factors, participants agreed that orange juices containing artificial ingredients orange juices were not fresh. Statements *additives flavour* (46: -5), *fermented flavour* (42: -5), *rotten flavour* (43: -4), *fizzy* (53: -4), *bright orange colour* (33: -3), *transparent colour* (34: -3) and *floating pulp* (59: -2) received lower ranking scores. In brief, they emphasized packaging attributes rather than the sensory qualities of the juice. Largely, this was because they believed that sensory perception varied by individuals.

5. Discussion

5.1. Study one: focus groups

Perceived freshness for a food during consumption is most often determined by intrinsic variables (Heenan, Hamid, Dufour, Harvey, & Delahunty, 2009). By evaluating freshness following consumption, participants had a tendency to agree that orange juices that contained fresh squeezed juices to be significantly fresher compared with juices produced with concentrated juice or orange flavour. These findings are consistent with Chen and Gao (2013), who found that most Chinese consumers preferred fresh squeezed orange juices because of freshness. Moreover, qualitative terms derived from focus groups, such as "sour", "astringent", "orange peel flavour", "pulpy" and "bitter aftertaste", was frequently used by participants to describe fresh orange juices. "Foamy" and "orange smell" were exclusively used to describe freshly hand squeezed juice. This finding indicated that participants preferred the untreated and natural orange sensory qualities. This is in agreement with previous research, which showed that the attributes given by consumers reflected a measurement of closeness to the original product (Péneau et al., 2009). In this instance, specific terms were used to describe the least fresh orange juices; they were "dilute", "no orange flavour", "sweetener-like flavour" and "artificial colour". In addition, this study also identified the important packaging attributes that contributed to freshness perceptions. This was evident in the specific descriptors that were used relatively frequently, including "orange image" and health claims on the package including "honest squeezed orange", "no preservatives" and "organic". This accords with earlier observations, which showed that the overall impression, such as perceived freshness, was susceptible to both image and textual labels (Mizutani et al., 2010). Meanwhile, it confirms the desire of participants is for orange juices with natural ingredients. In this sense, powdered juices were viewed as artificial or chemical orange-flavoured drink. It is interesting to note that freshness perception was influenced by culture; HPP orange juices were viewed as significantly less fresh when packages were presented only. The reason for this was that the white opaque plastic bottles were associated with cleaning

products or pesticide products' packages in China. Variation in the perceived freshness when evaluating either only the juices or only the packages suggested that freshness perceptions were based on an overall impression, which is influenced by both sensory and non-sensory characteristics. Focusing on either the sensory properties or alternatively, on the non-sensory properties does not result in a holistic view of consumer perception of this concept (freshness). The use of focus group uncovered a useful and diverse set of opinions towards freshness, which provided a detailed understanding of how intrinsic and extrinsic factors contributed to orange juice freshness.

5.2. Study two: Napping and Q method sorting activities

The statements placed close to the descriptor "*fresh*" indicate that study participants described freshness as a level of closeness to the orange. However, the three distinct consumer segments demonstrated that participants based their freshness evaluation on specific features of orange juice products that they considered to be important to freshness. As for 'sensory properties-driven consumers', the statements that described orange-like sensory qualities such as *bitter*, *astringent*, *thick texture*, *foamy*, *sour*, *juicy pulp*, *squeezed orange juice flavour* and *orange peel flavour* were perceived as fresh. It is interesting to note that 23% of participants in the current research were defined as 'pulp lover' consumers; they perceived all pulp-related statements in a positive way. This confirms the importance of closeness-to-original-orange participants placed on the freshness perception. In addition, participants reflected a measurement of physiological ageing; this was evident in the placement of statements, including *cooked flavour*, *fermented flavour* and *rotten flavour* close to the descriptor "*not fresh*". Although it is difficult to directly compare meanings between languages, especially for subjective terms such as "fresh", it is interesting to note that these results are in agreement with a definition of *frisch* (fresh) given by the Duden German Dictionary (1999), particularly for food: not old, stale and limp (Péneau et al., 2009). Ageing has been shown in several studies to be particularly important for food freshness (MAFF, 2000). In addition to this, Schwerdtfeger (1979) argues that any deterioration or decline of tissue from a freshly harvested state can be considered a decline in freshness. Furthermore, the representation of statements drawn from Napping indicated that the attribute freshness was a complex and holistic perception. Freshness was related to an overall notion of healthy and natural. This confirms that the participants linked the concept of freshness with natural ingredients and healthy. This was evident in the arrangement of statements that artificial-related or the preservatives-free-related package claims. Furthermore, participants preferred orange juices kept at refrigeration temperature to those orange juices kept at ambient temperature. This was a pursuit of natural ingredients with refrigerated orange juices perceived as having a higher intensity of natural squeezed juice content and fewer preservatives and additives. This finding mirrors those of the previous studies that have examined the relationship between freshness with healthy or natural. Heiss (1986) suggested a close relationship between the hedonic aspects and the freshness of food, with "fresh" being equivalent to good, healthy or natural while "industrially treated" would correspond to an inferior value, denatured or artificial.

The qualitative data derived from this study demonstrated that package design not only informs consumers about the products but also influences consumers' freshness perceptions. In particular, these non-sensory qualities are positive drivers for 'packaging information-driven consumers'. As aforementioned, "*no preservatives*", "*not from concentrate*", "*no added sugar*" and "*organic*" claims positively influenced perceptions of orange juice freshness. In addition to these claims, other packaging attributes, such as container

type, transparency, well-known brand and price were observed to have a great effect on participants' freshness perceptions. Participants perceived glass bottle to be fresher than plastic and canned. This could be explained by glass bottle-quality relationship that emerged in this study. Although glass containers have the disadvantage of being breakable and sometimes heavy, they provide a favourable feeling of quality. For participants, glass appeared to be synonymous with 'class'. Moreover, glass bottle juices were perceived as healthier because compared with plastic and canned juices, there were no harmful compounds being produced from glass. This finding mirrors another study reporting that health outweighs price when it comes to orange juice competing with soft drinks or other beverages (Granato, Branco, Nazzaro, Cruz, & Faria, 2010). High-price juices were viewed as high quality, consequently, as more fresh.

The critical role of visual characteristics was confirmed by study participants' great emphasis on the importance of package transparency. It reflects that the requirement for products to be "close to original form" for both sensory properties and time from manufacturing date (Fillion & Kilcast, 2000; Péneau et al., 2009). In the present study, a large percentage of participants were in agreement with the importance of package transparency to represent freshness. This was because the transparent juice bottles enabled them to observe the sensory properties of orange juice, including colour, textural characteristics and whether containing pulp. The last important packaging attribute is the amount of information on the package. The majority of participants perceived orange juices with much information on labelling to be fresher than those with not much information, because participants regarded much information on labelling as a way that food companies could guarantee their products' quality.

All consumer segments consider shelf life is an important attribute when evaluating freshness for orange juices. In literature, Chinese consumers ranked shelf life as the dominant factor when they were asked to choose the most important factors on purchase decisions (Wang, Mao, & Gale, 2008). Prior studies also have noted that the importance of manufacturing date and safety label on Chinese consumers' purchase decisions, which indicated that food safety was still the most important factor to Chinese consumers, perceiving shelf life as a proxy of food safety (Chen & Gao, 2013). In the context of this study, Chinese consumers perceived the orange juices that are manufactured on the same day, or as close as possible to the manufacturing date as freshest. The reason for this was that consumers embracing this value believed shorter shelf life products led to the consequence of few preservatives and additives. Consumers' awareness of food additives and preservatives resulted from the awareness of food safety. Food safety has become a major concern as Chinese consumers went through a string of food poisonings, including dangerous additives in food products, so it was not surprising to find that consumers link food additives or preservatives with food safety, consequently, to perceptions of freshness. This result matches findings observed in an earlier study where Chinese participants were also found to associate shorter shelf life with product quality and safety (Ortega, Wang, Wu, Bai, & Olynk, 2011). From this perspective, it is interesting to note that freshness perception can be influenced and stimulated by purchase locations. All consumer segments believe that those orange juices purchased at a farmers' market are fresher than those purchased in a vending machine. The participants embracing this attitude think that the fresh orange juices should be squeezed or manufactured on the day they are consumed. In this regard, the orange juices sold in a farmers' market could satisfy their expectations because participants mentioned they could see the squeezing process. This finding confirms the association between the transparent squeezing processes with positive freshness perception. It supported the finding of the previous study where fresh squeezing

of oranges in front of consumers increased not only the values of fresh squeezed orange juice but also the willingness to pay (Kim et al., 2012). On the contrary, orange juice purchased in vending machines was perceived as less fresh because of its slower turnover and relatively longer shelf life.

Unlike the Cardello and Schutz's (2003) study demonstrating that the consumers perceived the foods that were described as "minimally processed" (e.g. high pressure or pulsed electric fields) as less fresh than refrigerated or frozen foods, participants in the current study perceived processing technologies positively. Pasteurization was viewed as an effective way to inactivate microorganisms. During the interviews, even though the participants explained they were not knowledgeable about what cold pasteurization meant, they perceived it to be a claim that food companies guarantee the quality and safety by processing under low temperature and treat orange juices without loss of vitamin C. Like some other food products in China, juice products are also subject to the problem of consumers' insufficient confidence in food product safety. It seems that Chinese consumers have little faith in either the safety or the quality of orange juice (Chen & Gao, 2013). The Chinese consumers' insufficient confidence in orange juice safety could be a potential reason for the participants' positive response to processing technologies identified in the present study.

This research has been the first to explore both the sensory and non-sensory attributes influencing freshness perception in a Chinese setting. Interestingly, the results do indicate a relatively high level of consensus with results from Western-centric published literature on freshness perceptions. Both Western and Chinese Consumers seem to equally perceive attributes such as 'closeness to the original product', 'not aged', 'healthy', and 'short shelf life' as being particularly fresh. However, results from this study also indicate that there are some particularities which make Chinese consumers' freshness perceptions unique. The aforementioned difference in Western and Chinese perceptions of the relationship between processing technologies and freshness provides an example of cultural dissimilarities. The links that the Chinese consumers made between container type, package transparency and fresh (i.e. the overwhelming preference for glass and transparent bottles and a strong negative association for white opaque plastic bottles) are novel findings which are obviously culturally bound. Given the important role that packaging and processing play in determining freshness perceptions, this study has reinforced the obvious need for further research on consumer food and beverage preferences to be conducted in non-Western settings.

6. Conclusion

This research demonstrates the effect of multidimensional sensory and non-sensory characteristics interaction on building consumers' freshness perceptions. Napping provided holistic product configurations that included both quantitative and qualitative information with regards to freshness, which is particularly important in studies that aim at understanding what really matters for consumers. However, it is noteworthy that there are some statements (i.e. those statements positioned on the positive axis of factor 2) that cannot be well interpreted with Napping map only, indicating that the way participants perceived those statements are different. Thus, the data generated by employing Q method greatly enhances the understanding of the Napping results by distinguishing the different viewpoints towards freshness. From a marketing perspective, the results suggest the need to offer a range of different orange juices to ensure that all consumers are satisfied. The consumer segments provide a valuable insight into identifying how to market and communicate freshness from a meaningful consumer perspective. In summary, Napping provided detailed

product differentiation maps according to different level of perceived freshness while Q methodology provided an in-depth investigation into the underlying reasons behind participants' behaviours. Q methodology thus, was helpful in identifying the consumer segments to further enhance the picture of the product space created by the Napping. As such, the combination of Napping and Q method enabled a more pertinent interpretation of the freshness perception for orange juice product that is directly relevant from the consumer standpoint.

As with any study, this research had some limitations. One limitation was that the scope of the results was limited to the study participants: young immigrant Chinese living in New Zealand. As such, the results generated from this research cannot be generalized to all young Chinese consumers without further validation of the study's results. Another limitation was the inevitable limitations of providing sorting items (the statements) to use to determine consumers' perceptions of freshness. Although care was taken to make sure that as wide a range as possible of stimuli was presented to participants and piloting was conducted, participants' perceptions were assessed in the context of the predetermined set of sorting items. Again, further generalization of the study results, with a different set of sorting items representing freshness would be worthwhile.

The concept of freshness is broad and the word "fresh" is interpreted in different ways by consumers with different demographic background and consumption habits. This research has not analysed the influence of demographic factors (e.g. age, gender), nor of consumption habits on freshness perceptions of orange juices, which would be a useful area for future work. The high correlation between factors revealed in this study indicates that there is, at least within this particular study population, some degree of cultural consensus on the concept of "fresh". Although outside the scope of this study, it would be interesting to explore this avenue further by employing a version of the aforementioned cultural consensus model to provide estimates of the culturally correct answers to defining "fresh" and to then estimate individual differences in the accuracy of reported information.

The current research evaluated freshness using two sorting activities with a set of statement cards. This integrated approach might provide an alternative to expensive and time dependent consumer testing with actual products in the process of new product development. However, this study has not compared the results from the freshness evaluations were obtained using statement cards with results obtained via alternative measurement possibilities such as tasting actual orange juice products. This comparison would be a useful area for future work. The present study sheds light on the meaning of the multidimensional word "freshness" by providing details of the attributes influencing the level of perceived freshness. These product attributes that consumers associate with orange juice freshness could be used by food marketers to design and communicate freshness from a marketing perspective.

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