

Influence of fibre enrichment declaration on consumers' perception of functional milk desserts

Influência da declaração de enriquecimento com fibras na percepção dos consumidores de sobremesas lácteas funcionais

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Summary

Communication of health benefits to the public is an essential element for the development and marketing of functional foods. In this context, the aim of the present work was to study the influence of different types of fibre enrichment declarations on consumers' perception of functional chocolate milk desserts. A rating-based conjoint analysis with 135 consumers was carried out. Milk dessert concepts were designed using a full factorial design with two categorical factors: name of the ingredient (three levels: declared using a common name –fibre- or a specific source of fibre –wheat bran and resistant starch-), and claim (three levels: 'no claim', 'enhanced function' claim or 'reduced disease risk' claim). Consumers were asked to rate the familiarity, perceived healthiness, expected liking and willingness to purchase each of the desserts, and had to complete a questionnaire related to their attitudes towards health and nutrition. Two consumer groups with different attitude towards health and nutritional issues were identified; which significantly differed in their perception of the functional chocolate milk desserts. Participants more interested in health significantly increased their willingness to purchase when fibre-enriched desserts were considered; whereas participants less interested in health showed the opposite behaviour. Moreover, the higher willingness to purchase scores were found when the addition of fibre was declared using its common name and when health claims were included.

Key words: *Consumer studies; Functional foods; Conjoint analysis.*

Resumo

Comunicação de benefícios para a saúde pública é um elemento essencial para o desenvolvimento e comercialização de alimentos funcionais. Neste contexto, o objetivo do presente trabalho foi estudar a influência dos diferentes tipos de declarações de enriquecimento de fibra na percepção dos consumidores de sobremesas lácteas funcionais de chocolate. Um análise conjunto com 135 consumidores foi realizado. Conceitos de sobremesas lácteas foram projetados usando um modelo fatorial completo com dois fatores categóricos: nome do ingrediente (três níveis: nome comum –fibra- ou uma fonte de fibra específica –farelo de trigo e amido resistente-) e alegações de saúde (sem alegações, alegações de melhora da funções do corpo ou alegações do redução do risco de doença). Os consumidores foram convidados a avaliar a familiaridade, salubridade percebida, as expectativas hedônicas e a vontade de adquirir cada uma das sobremesas, e eles tiveram que responder um questionário em relação à sua saúde e nutrição. Dois grupos de consumidores com atitudes diferentes em relação à questões de saúde e nutrição foram identificados, que diferiram significativamente na percepção das sobremesas funcionais. Os participantes mais interessados em saúde aumentou significativamente a sua disponibilidade para compra, quando as sobremesas foram enriquecidas com fibra; enquanto que os participantes menos interessadas em saúde mostrou o comportamento oposto. Além disso, a maior vontade de comprar fora encontrada quando a adição de fibras foi declarada com o seu nome comum, e quando as alegações de saúde foram incluídos.

Palavras-chave: *Estudos de consumidor; Alimentos funcionais; Análise conjunta de fatores.*

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1 Introduction

Persuading people to make healthier food choices and consume functional foods could provide important public health effects, such as decreased mortality and increased quality of life (WORLD HEALTH ORGANIZATION, 2003; SIRÓ et al., 2008). Functional foods can be regarded as foods that beneficially affect one or more target functions in the body beyond adequate nutritional effects, in a way that is relevant to either an improved state of health and well-being or a reduction of risk of disease (MARGARET et al., 2002).

Consumers perceive functional foods as members of the particular food category to which they belong (URALA e LÄHTEENMÄKI, 2003; SIRÓ et al., 2008). When shopping for a product within a certain food category, consumers have to choose between functional and conventional foods. Thus, consumers can only be expected to choose functional foods over conventional ones if the former are perceived as healthier. For this reason, consumers need to be informed about their beneficial health effect, they must trust in the health claim, perceive it as safe and they must have a perceived need for using the product (LÄHTEENMÄKI, 2003). Unlike other product characteristics, consumers cannot directly perceive the health benefits derived from functional foods consumption (URALA e LÄHTEENMÄKI, 2004; PENG et al., 2006). Therefore, communication of health benefits to the public has been claimed to be an essential element for improving public health and for the development of functional foods (AGGET et al., 2005).

In general, consumers have a limited knowledge of the health effects of functional ingredients (BECH-LARSEN et al., 2001; ARES et al., 2008). Therefore, the use of health claims seems necessary for assuring that consumers are aware of the health benefits of the product and therefore consider substituting conventional foods by their functional alternatives (MENRAD, 2003).

Food companies usually use 'enhanced function' or 'reduced disease risk' health claims to efficiently communicate the health-effect of functional foods to consumers. The extent to which consumers find health claims appealing and trusty depends on the content and format of the message (MAZIS and RAYMOND, 1997). Basically, message of health effects could be formulated to provide a potential benefit (e.g. 'enhanced function') or to prevent a negative situation (e.g. 'reduced disease risk'). The use of one type of claim depends on which has the greater persuasive impact on consumers (VAN KLEEF et al., 2005). Some authors have stated that enhanced function claims might be more appealing to consumers than reduced disease risk claims, because the former evoke positive associations from memory rather than confronting consumers with illness and problems they might suffer in the future (VAN KLEEF et al., 2005).

However, little research has been made on this topic and results in literature regarding the effect of claims are rather contradictory. While van Kleef et al. (2005) reported that Dutch consumers reacted more favorably to 'disease reduced risk' claims than to 'enhanced function' framed health claims; Bech-Larsen et al. (2001) reported the opposite trend. The fact that consumers preferred 'disease reduced risk' claims could be explained considering that in many cases negative information is more informative, attracts more attention and stimulates deeper processing than positive information.

Consumers are increasingly segmented on the basis of their attitudes towards health and nutrition-related issues (ROININEN et al., 1999). In order to consume functional foods, consumers should think that these food products will have a relevant positive effect on their health status. Several authors have reported that consumers more interested in health and nutrition-related issues have a more positive attitude towards functional foods than consumers less interested in maintaining their health status (LÄHTEENMÄKI, 2003; COX et al., 2004; URALA e LÄHTEENMÄKI, 2004; ARES et al., 2009a).

In this context, the aims of the present work were to: a) study the influence of different ways of declaring fibre enrichment in consumers' perception of functional milk desserts; and b) evaluate if consumers' attitudes towards health affect that perception.

2 Material and methods

2.1 Participants

The study was conducted in the city of Montevideo, Uruguay. One-hundred and thirty-five people participated in the study; 42% of which were males and 58% females. Participants ranged in age from 18 to 68 years old (mean 35.7 years old, standard deviation 14.1 years old). All participants consumed milk desserts at least once a week, and were randomly recruited at shopping areas, universities campus and public places based on their availability and interest to participate in the study.

2.2 Conjoint study

A chocolate milk dessert was selected as carrier product considering that they are widely consumed worldwide, and particularly in Uruguay, by several groups of consumers. Besides, this product has been identified by Uruguayan consumers as an interesting base product for the development of functional foods (ARES et al., 2008, 2009a).

The conjoint design consisted of two categorical factors: name of the ingredient (three levels: declared using a common name –fibre- or a specific source of fibre –wheat bran and resistant starch, two sources of

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insoluble fibre with different familiarity-), and claim (three levels: 'no claim', 'enhanced function' claim or 'reduced disease risk' claim). Table 1 summarizes factors and levels used in the study.

The three factors were varied independently of each other, following a full factorial design. This design resulted in 9 (3*3) combinations of attributes plus a regular milk dessert (without the addition of fibre and without any health claim, presented to consumers as 'milk dessert'), which was used as control. Therefore, participants evaluated a total of 10 milk dessert concepts, which are presented in Table 2. All the information was presented using cards using an image of a chocolate milk dessert. Images were printed in glossy paper and coated with contact paper, as shown in Figure 1.

Images were presented to participants numbered with three-digit random codes. Participants were asked to score the familiarity and perceived healthiness of the different desserts, using a 7-box scale labelled on the left with 'not at all' and on the right with 'very', to score their expected liking using a 7-box scale labelled on the left with 'I would dislike it very much' and on the right with 'I

would like it very much', and to rate their willingness to purchase them using a 7-box scale labelled on the left with 'I would definitely not purchase it', on the middle with 'Maybe yes, maybe not' and on the right with 'I would definitely purchase it'.

Most consumers are not aware of the health effects of fibre (BECH-LARSEN et al., 2001; ARES et al., 2008). Thus, if consumers have read a card that related fibre consumption with a health benefit they would have associated the ingredient with the health benefit in the upcoming evaluations. Therefore, in order to minimize the influence of the information presented on some of the cards on consumers evaluations, figures were presented in the following order: first participants evaluated the figure corresponding to the regular milk dessert, then they evaluated figures corresponding to desserts without any type of claims and finally images corresponding to deserts with enhanced function and reduced disease risk claim. Figures within each category were presented in random order, which eliminated the possibility of order effects. Using this presentation order, consumers first evaluated how healthy they thought a milk dessert and milk desserts with different sources of fibre were. This evaluation was based on consumers' previous knowledge about the ingredients, without any type of external influence or information. Then, consumers evaluated the same functional milk desserts but now having information about their effect on health.

Finally, participants were asked to answer a questionnaire about their attitudes towards health and nutrition. The attitudinal questionnaire was designed by modifying some items from the Health and Taste Attitudes Scale (ROININEN et al., 1999) and from a questionnaire about attitudes towards fibre (ARES et al., 2009b). Participants had to endorse their degree of agreement with 23 statements using a 7-box scale anchored with 'I completely disagree' on the left and 'I completely agree' on the right. The items of the questionnaire are shown in Table 3.

Table 1. Attributes and levels description for the conjoint analysis.

Factor	Levels and Description
Name of the ingredient	1) Common (Fibre) 2) Specific source (Wheat bran) 3) Specific source (resistant starch)
Health claim	1) No health claim 2) 'Enhanced function' claim (Fibre consumption reduces glycemic index and encourages growth of beneficial bacteria in the gut) 3) 'Reduced disease risk' claim (Fibre consumption reduces the risk of colon cancer)



Figure 1. Example of two functional milk dessert images used in the conjoint analysis study.

2.3 Data analysis

2.3.1 Cluster analysis

In order to identify groups of consumers who had different attitudes towards health and nutrition, a hierarchical cluster analysis was performed on standardized data from attitudinal questionnaire. Euclidean distances and Ward's aggregation method were considered.

The existence of differences between the clusters' gender and age frequency distributions was evaluated using the chi-square statistical test.

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Table 2. Description of the 10 milk desserts presented to participants and corresponding attribute levels (cf. Table 1).

Description	Name of the ingredient	Health claim
1) Regular milk dessert (*)	-	-
2) Milk dessert enriched with fibre	1	1
3) Milk dessert enriched with wheat bran	2	1
4) Milk dessert enriched with resistant starch	3	1
5) Milk dessert enriched with fibre	1	2
'Fibre consumption reduces glycemic index and encourages growth of beneficial bacteria in the gut'		
6) Milk dessert enriched with fibre	2	3
'Fibre consumption reduces the risk of colon cancer'		
7) Milk dessert enriched with wheat bran	1	2
'Fibre consumption reduces glycemic index and encourages growth of beneficial bacteria in the gut'		
8) Milk dessert enriched with wheat bran	2	3
'Fibre consumption reduces the risk of colon cancer'		
9) Milk dessert enriched with resistant starch	3	2
'Fibre consumption reduces glycemic index and encourages growth of beneficial bacteria in the gut'		
10) Milk dessert enriched with resistant starch	3	3
'Fibre consumption reduces the risk of colon cancer'		

2.3.2 Analysis of variance

Analysis of variance (ANOVA) was performed on data from familiarity, perceived healthiness, expected liking and willingness to purchase. The ANOVA method used in the present study was the following (NAES et al., 2001) (Equation 1):

$$Y = \text{mean} + \text{main effects for conjoint variables} + \text{main effects for cluster} + \text{interactions among conjoint variables} + \text{interactions between cluster and conjoint variables} + \text{random error} \quad (1)$$

The main effects consisted on both the main effects in the conjoint design (name of the functional ingredient and claim) and the main effect for cluster. Effects were regarded as fixed and all interactions were considered. Nesting of consumers within Clusters was not considered in the analysis. When the effects were significant, honestly significant differences were calculated using Tukey's test. Differences were considered significant when $p \leq 0.05$.

All statistical analyses were performed using XL-Stat 2009 (Insightful, NY, USA).

3 Results and discussion

3.1 Cluster analysis

Based on the dendrogram obtained from hierarchical cluster analysis performed on the questionnaire related to consumers' attitudes towards health and nutrition, two clusters were identified: Cluster 1, composed of

42 participants (31% of the sample), and Cluster 2, composed of 93 individuals (corresponding to 69% of the sample).

Highly significant differences were found between clusters' ratings for the 23 items of the questionnaire, as shown in Table 3. Consumers in Cluster 2 scored all the items significantly higher than Cluster 1, except for item 22, which was negatively related to interest in health and nutrition. Thus, participants in Cluster 2 were more interested in health and nutrition, and particularly more interested in increasing their fibre intake; indicating that they might have a more positive attitude towards fibre enriched chocolate milk desserts.

Highly significant differences were shown in the age ($\chi^2 = 12.3$; $p = 0.0005$) and gender ($\chi^2 = 15.9$; $p = 0.0001$) distribution of the clusters. Cluster 1 was mainly composed of men (66%) and consumers aged between 18 and 34 (83%). On the other hand, Cluster 2 was composed of 70% women and had a more balanced age distribution, being 52% of the consumers between 18 and 34 years old and 48% older than 34 years. This suggests that Cluster 2, which comprised those consumers more interested in health and nutritional issues, was composed of women and older. This is agreement with Bogue and Ryan (2000), De Jong et al. (2003) and Siró et al. (2008), who reported that the most positive group towards the effects of diet on health and functional foods are women and middle-aged or elderly consumers. Therefore, women and older consumers seem to be the most appropriate target group for chocolate milk desserts enriched with fibre.

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Table 3. Items of the attitudinal questionnaire about health and nutrition, and average scores for each of the two identified clusters.

Statements	Average score*	
	Cluster 1 (n = 42)	Cluster 2 (n = 93)
1) I have the impression that I sacrifice a lot for my health	2.9 ^a	4.3 ^b
2) I think a good knowledge of how to eat healthily is important	5.6 ^a	6.7 ^b
3) Diet is important for my health	4.6 ^a	6.2 ^b
4) Consuming fibre-rich products is important for my health	4.5 ^a	6.5 ^b
5) I think my health is influenced by my food	4.4 ^a	6.0 ^b
6) I am concerned about the deterioration of my health	4.7 ^a	6.1 ^b
7) There are diseases and health disorders related to low fibre intake	4.4 ^a	6.2 ^b
8) I am willing to make sacrifices to keep myself healthy	4.2 ^a	5.5 ^b
9) I am interested in increasing my fibre intake	3.8 ^a	5.8 ^b
10) My diet is well-balanced and healthy	3.0 ^a	4.3 ^b
11) My fibre intake is adequate	3.2 ^a	4.4 ^b
12) Fibre intake is useful for prevention and treatment of constipation	4.1 ^a	6.2 ^b
13) I am concerned about the quantity of salt that I get in my food	3.6 ^a	4.5 ^b
14) I am concerned about the quantity of fat that I get in my food	4.2 ^a	5.1 ^b
15) I am concerned about the quantity of fibre that I get in my food	3.1 ^a	4.6 ^b
16) I am interested in consuming fibre-enriched products	3.6 ^a	5.7 ^b
17) I am interested in consuming fibre-enriched products even if I don't like them as much as the non-enriched version	2.9 ^a	5.1 ^b
18) I am concerned about the risk of high blood pressure	4.2 ^a	5.6 ^b
19) The amount of sugar I get in my food is important	3.8 ^a	5.3 ^b
20) The amount of vitamins and minerals that I get in my food is important	4.3 ^a	5.8 ^b
21) I am concerned about the amount of cholesterol that I get in my food	3.6 ^a	5.5 ^b
22) I usually do not ask myself whether the foods I eat are good for me	5.1 ^a	3.6 ^a
23) I think my health is influenced by my food	5.0 ^a	5.9 ^b

Values with different superscripts within one row indicate that average scores for Cluster 1 and Cluster 2 are significantly different ($p \leq 0.05$). *Items were evaluated in a using a 7-box scale anchored with 'I completely disagree' on the left and 'I completely agree' on the right.

3.2 Conjoint analysis

ANOVA revealed that the name used for declaring the addition of fibre significantly affected familiarity, perceived healthiness, expected liking and willingness to purchase. On the other hand, the variable health claim was only significant for perceived healthiness and willingness to purchase. It is important to highlight that in most significant comparisons differences were small and therefore the influence of the abovementioned variables on consumers' perception of the evaluated functional chocolate milk desserts was small.

The main effect for Cluster was highly significant for all the evaluated variables, suggesting that differences in interest towards health and nutrition affected consumers' perception and interest in the functional milk desserts. None of the interactions were significant; suggesting that the effect of the different evaluated parameters could be analyzed separately.

As shown in Table 4, the consideration of a common name for fibre obtained the highest familiarity scores, suggesting that consumers perceived as more familiar

a fibre-enriched milk dessert, than one enriched with a specific type of fibre. Therefore, consumers might be more prone to purchasing and consuming functional foods with functional ingredients that are familiar to them. The use of compound or scientific names might not be recommended as they could have a negative impact on consumers' perception of the product.

It is interesting to notice that desserts enriched with resistant starch and wheat bran did not differed in their familiarity. This could be explained by considering that consumers perceived resistant starch as the regular starch they use for cooking, and therefore evaluate its familiarity similar to that of wheat bran.

The presence of health claims did not affect consumers' familiarity perception, suggesting that consumers did not take this information into account when evaluating their familiarity.

Although consumers perceived desserts enriched with wheat bran less familiar than those enriched with fibre, they perceived no significant differences in their healthiness. This suggests that consumers might

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Table 4. Average scores for the significant effects in the ANOVA for familiarity, perceived healthiness, expected liking and willingness to purchase for chocolate milk desserts enriched with fibre.

	Average score*			
	Familiarity	Healthiness	Expected liking	Willingness to purchase
Name				
Fibre	3.2 ^b	5.0 ^b	4.4 ^b	4.6 ^b
Resistant starch	2.7 ^a	4.4 ^a	3.9 ^a	4.0 ^a
Wheat bran	2.7 ^a	4.8 ^b	3.9 ^a	4.2 ^a
Claim				
No claim	2.8 ^a	4.2 ^a	4.0 ^a	4.0 ^a
'Enhanced function' claim	2.9 ^a	5.0 ^b	4.2 ^a	4.4 ^b
'Disease reduced risk' claim	3.0 ^a	5.0 ^b	4.1 ^a	4.4 ^b
Cluster				
Cluster 1	2.7 ^a	4.4 ^a	3.6 ^a	3.9 ^a
Cluster 2	3.1 ^b	5.0 ^b	4.5 ^b	4.6 ^b

Mean values sharing the same letter within a column and category are not significantly different ($p > 0.05$). *Items were evaluated using 7-box scales.

associate wheat bran with fibre and that they might be equally aware of their health benefits. On the other hand, milk desserts enriched with resistant starch were perceived as less healthy; which could be explained considering that consumers are not aware of this functional ingredient and of their associated health effects.

Health claims had a positive impact on consumers' perception of the healthiness of milk desserts; which show that the use of this communication strategy could increase Uruguayan consumers' interest in consuming functional foods for achieving a positive effect on their health. According to Levy et al. (1997) American consumers' perceptions of the healthiness of functional foods are rather based on prior beliefs about the type of carrier product than on specific health claims. However, Uruguayan consumers seemed to consider health claims when evaluating the healthiness of functional foods. This could also be attributed to the fact that Uruguayan consumers are not much aware of the health effects of fibre (ARES et al., 2008) and therefore increase their healthiness evaluations when health claims are used.

Perceived healthiness scores were not significantly different for products with 'enhanced function' or 'reduced disease risk' claims. Consumers showed the same attitude towards both types of claims, suggesting that they might not be affected by confronting with illness and problems they might suffer in the future. These results indicate that both type of claims could be included in functional foods' labels and might be appealing for consumers.

Regarding expected liking, milk desserts enriched with fibre showed the highest scores; whereas when specific sources of fibre were mentioned consumers decreased their expected liking. This could be attributed to the fact that when consumers knew the source of the functional ingredient they expect to find a milk dessert

having the flavour of the source and therefore they decrease their expected liking. This suggests that the use of information about the specific source of fibre might not be recommended since consumers might expect a product they might not like as much as the regular one. Moreover, health claims did not have any influence on consumers' expected liking scores of the functional milk desserts.

As shown in Table 4, milk desserts enriched with fibre with health claims showed the highest willingness to purchase scores; indicating that consumers preferred those desserts enriched with a familiar functional ingredient they expect to like, and which has a health claim stressing the relationship between its consumption and a positive effect on their health.

Regarding differences between the Clusters, as shown in Table 4, Cluster 2, which was composed of those participants more interested in health and nutritional issues, gave higher familiarity, perceived healthiness, expected liking and willingness to purchase scores than those in Cluster 1 to the functional milk dessert concepts.

Thus, consumers more interested in health perceived milk desserts enriched with fibre as more familiar, probably because they are more familiar with fibre-enriched products and therefore more aware of this nutrient. A higher awareness about fibre and the effects of fibre consumption on health could also explain the higher perceived healthiness scores of Cluster 2. The higher interest of consumers in Cluster 2 in health and nutrition was also reflected in higher expected liking and willingness to purchase scores, as expected. This is in agreement with Lähteenmäki (2003) and Siró et al. (2008) who reported that consumers' attitudes towards health are central in determining their interest in functional foods.

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However, despite the different interest of consumers in Cluster 1 and 2 towards the evaluated functional milk desserts, the interactions Cluster * Name, Cluster * Health claim and Cluster * Name * Health claim were not significant. This indicates that both Clusters reacted similarly towards the evaluated variables, name of the ingredient and health claims. Therefore, regardless of consumers' interest in health and nutrition, the best way to communicate information related to fibre enrichment was by its common name, i.e. enriched with fibre, and using health claims that stress the health benefits of fibre consumption.

Furthermore, apart from evaluating the influence of the conjoint variables it is also interesting to study differences between the Clusters' perception of functional and regular milk chocolate desserts.

Fibre-enriched desserts were perceived as less familiar and healthier than the regular milk dessert for consumers in both Clusters (Figure 2). However, it is

interesting to notice that the influence of fibre enrichment on expected liking and willingness to purchase was different. In the case of participants in Cluster 1, who showed a low interest in health-related issues, the addition of fibre to the desserts caused a significant decrease in their expected liking and willingness to purchase. Thus, these consumers thought that they would not like the functional products, were not willing to compromise on their sensory characteristics for eventual positive health effects, and therefore were not interested in consuming desserts enriched with fibre.

On the other hand, consumers in Cluster 2, who were interested in health related issues, did not modify their expected liking when fibre was added to the desserts with respect to the regular product. Regarding their willingness to purchase, these consumers increased their scores when fibre-enriched products were considered (Figure 2). Therefore, consumers in this Cluster were

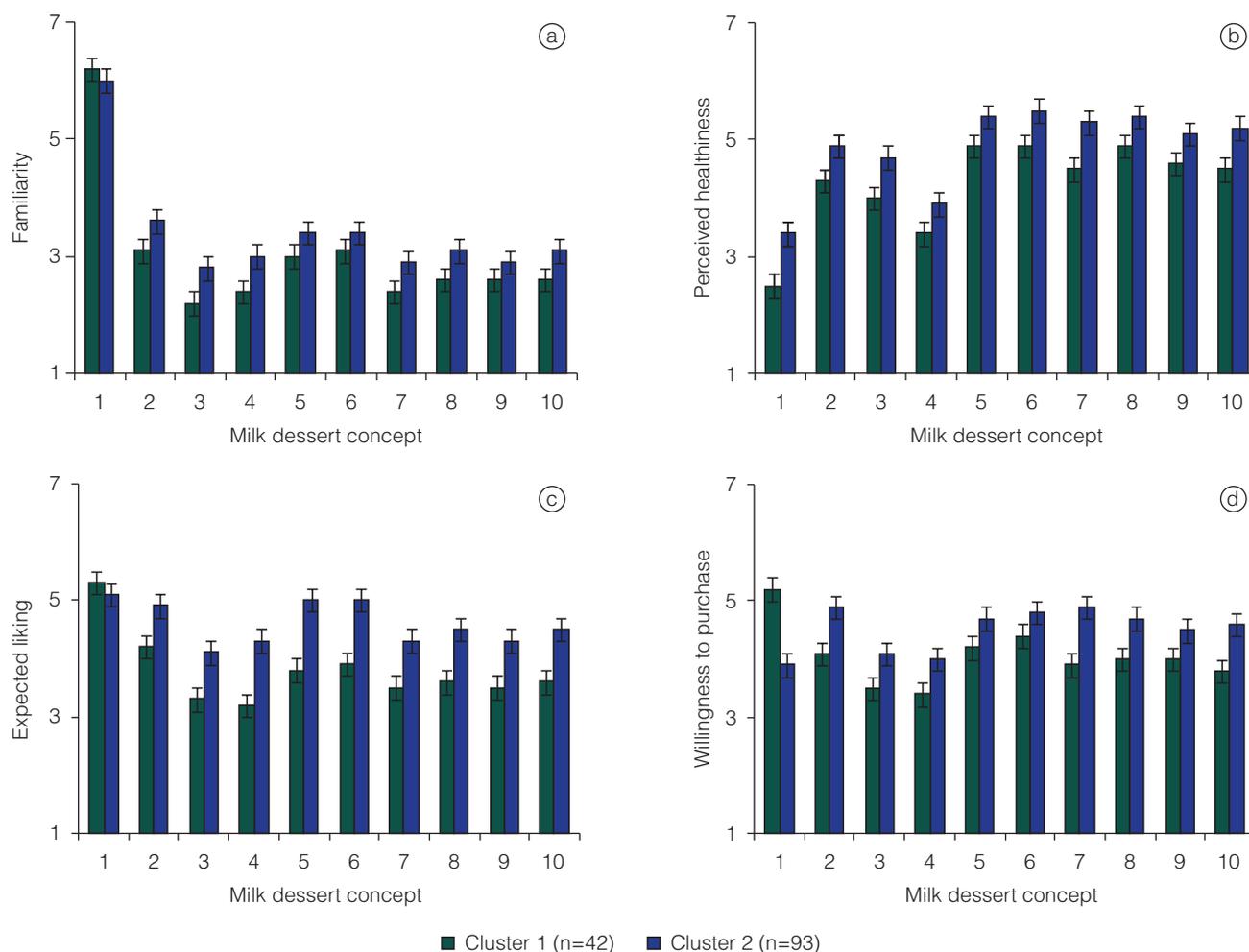


Figure 2. Average for a) familiarity, b) perceived healthiness, c) expected liking, d) willingness to purchase for the regular milk dessert (1) and functional milk dessert concepts for Clusters 1 and 2. Vertical bars represent Tukey's honestly significant differences for a 5% confidence level. The milk dessert concepts are coded according to Table 1.

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clearly interested in consuming functional milk desserts enriched with fibre.

Differences between the two identified clusters highlight the importance of attitudes towards health in consumers' interest in functional milk desserts. Moreover, it is interesting to notice that the Cluster not interested in milk desserts enriched with fibre comprised just 31% of the consumer sample, suggesting that there might be an interested market for this type of product in Uruguay.

4 Conclusions

Results suggested that familiarity, perceived healthiness, expected liking and willingness to purchase scores were significantly affected by how fibre enrichment was declared. The best results were achieved when the common name for fibre was used, suggesting that consumers clearly preferred functional ingredients which are familiar to them and which do not associate with specific flavours. However, it is important to highlight that the influence of these variables on consumers' perception of the evaluated functional milk dessert concepts was rather small.

Regarding the use of health claims, it seems that this communication strategy might be necessary to increase consumers' awareness of the positive health effects and functional ingredients and their interest in consuming functional foods.

Differences between the clusters' perception of the evaluated functional milk dessert concepts suggest that segmentation based on attitudes to health and nutritional issues seem a key strategy when developing functional foods since there might be products targeted to a specific market segment.

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