

USING 7-POINT FACIAL HEDONIC SCALE TO COMPARE CHILDREN PREFERENCE TOWARDS PASTEURISED MILK AND UHT MILK: A CASE STUDY ON LOCAL COMMERCIAL PRODUCTS

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ABSTRACT

Children are an important targeted consumer group of food and beverage industry nowadays, especially of dairy industry. Understanding children liking for sensory properties of a food product is the key for product development success. Pasteurised milk and UHT milk are two major choices for children drinking milk in Vietnamese market. The difference in production process of these two products, mostly the heating treatment, may occur differences in terms of sensory properties and by consequence affect children's preference. The objectives of this study were then i) to verify ability of the 7-point facial hedonic scale in evaluating children preference of different age groups; and ii) to compare the degree of liking of pasteurised milk and UHT milk by children. 240 children aged from 4 to 13 participated to an acceptance test using 7-point facial hedonic scale. One pasteurised milk sample, one UHT milk sample and one UHT sweetened control sample collected from the market were tested. These 3 testing products belong to one local producer. Results showed that for all testing age groups children rated the control sweetened sample as the most favourite. This helps to justify that children of these ages are able to use the scale. There was no difference of children liking for tested pasteurised milk and UHT milk on all testing age groups. Possible sensory difference between these products is not resulted in preference differences among the testing children. Further results on the effect of age group, gender and general milk liking of children were also discussed.

Keywords: pasteurised milk; UHT milk; children preference, 7-point facial hedonic scale.

1. INTRODUCTION

Children now become a very important targeted consumer group of many food and beverage industries, including dairy industry. The sensory properties of a food are important determinants of their acceptance among consumers, and as a result, the need for sound methodology for sensory testing with children has increased. Children are a specific group of consumers that very much differ from the classical testing group, the adults. Sensory or

consumer tests for children must take into account the range of sensory and cognitive abilities of children from infancy to teen age. This paper focused on application of 7-point facial hedonic scale, a method developed and tested by many authors during the last fifteen years to evaluate the preference to a food or and a beverage of pre-schoolers (4-5 years), early-readers (6-8 years), and pre-teens (9-12 years). The results of the test could lead to a better utilisation of this method by food industry in Vietnam, where sensory test with children has been not widely conducted [1, 2].

Pasteurisation, a procedure invented by Pasteur, involves heating the milk up to a temperature of 72 - 75 °C and keeping it at this temperature for approximately 15 - 20 seconds before cooling it. Pasteurised milk has a validity term of 5-15 days if refrigerated accordingly during transport and distribution. Through ultra-pasteurisation the milk is intensely heated for only 2-4 seconds at a temperature of 135 - 150 °C. The UHT procedure (Ultra-High Temperature) is a continuous process which takes place in a closed system, preventing the product from being re-contaminated with germs from the air. The product goes through a rapid succession of heating and cooling stages. The aseptic filling is part of the process which prevents recontamination. The result is a product which can be kept for about six months without refrigeration until being unsealed [3].

The growth of UHT milk has been remarkable, increasing worldwide in the past 20 years especially in Europe, Asia, and America. In some parts of the world, especially in traditional markets of milk, UHT milk has been slowly accepted. Beside the familiarity with fresh milk of consumers of these markets and the higher cost of UHT milk, the processed/cooked/caramelised, fatty/stale flavours, brown colour, astringent mouth feel and bitter taste have been also reported as possible barriers to the consumption of UHT milk [4, 5]. The variation in terms of sensory properties between UHT milk samples collected from different countries has also been confirmed by highly trained sensory panels. This suggested that manufacturing process of UHT milk has a big impact in determining sensory properties of UHT milk [6].

In Vietnam, a young milk production and consumption country, studies on drinking milk sensory properties and consumer acceptance are few. In this sector, children from the age of pre-schooler (from 3 years old) are main end consumers. Among the available product in the market, UHT milk is observed to be often cheaper and more convenience for everyday consumption than pasteurised milk. This study aimed to confirm if possible differences in terms of sensory properties between UHT milk and pasteurised milk will be resulted in acceptance differences among targeted consumer groups.

Literature showed that children as young as 3 years can provide reliable consistent information about their food preferences. However, the limitations in the cognitive abilities of children pertinent to sensory testing include limited verbal skills, short attention span, and difficulties in task comprehension. That causes a difficulty to choose the proper form and proper length of the hedonic scale to apply in children preference tests. As Kimmel et al. found that children as young as 4 years old can use a 7-point facial hedonic scale with Peryam and Kroll verbal descriptors, we would try to use the scale in this study with obviously a verification of its ability [1, 7, 8, 9].

In another study, authors showed that the liking of sweet reflect children's basic biology. Children are born preferring sweet tastes, which attract them to mother's milk. They prefer higher levels of sweet than do adults, with preferences declining to adult levels during middle to late adolescence, which coincides with the cessation of physical growth [10]. Hence, adding one sweetened sample in the range of testing products is to confirm whether children are able to understand and use the 7-point facial scale due to the innate preference of children for sweet

taste. In case that they do, the liking score for sweetened sample should be significant higher than other samples.

In conclusion, the present study has twofold objective: i) to verify the ability of the 7-point facial hedonic scale in evaluating children preference of different age groups; and ii) to compare children degree of liking for pasteurised milk and UHT milk.

2. MATERIALS AND METHODS

2.1. Milk products

For every hedonic test, three milk products were used, including one pasteurised milk, one UHT milk and one UHT sweetened milk. To avoid composing ingredients in milk may influence the result of the test, local commercial products with 100% fresh cow milk were used. The products were bought in the supermarket at the time of the test and had very recent dates of production.

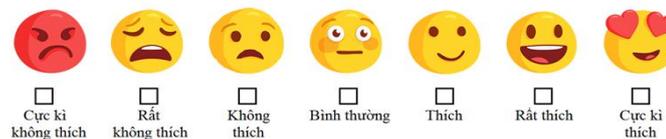


Figure 1. Adapted 7-point facial hedonic scale with Vietnamese wording

Cực kỳ không thích: Dislike extremely

Rất không thích: Dislike very much

Không thích: Dislike

Bình thường: Neither like nor dislike

Thích: Like

Rất thích: Like very much

Cực kỳ thích: Like extremely

2.2. Participants

240 children participated in this study. They were recruited from different schools in QuangNinh province (Vietnam) during April 2016. Experiment information including objectives, testing procedure and products were agreed by school managers. Children and their parents were informed of the test and could refuse to participate if they did not want to. The participants were balanced in terms of gender (120 boys and 120 girls). They consume drinking milk at least once a week. Three age groups were formed: pre-schoolers: 80 participants aged from 4 to 5 years old; early-readers: 80 participants aged from 6 to 8; pre-teens: 80 participants aged from 9 to 12 years old.

2.3. Seven-point facial hedonic scale

A seven-point facial hedonic scale with Peryam and Kroll verbal descriptors for children was used. It was adapted with colour familiar facial icons and Vietnamese wording (Figure 2).

2.4. Procedure

40 mL of milk sample were served in 110 ml plastic cup at room temperature. Samples were coded using a 3-digit code randomly generated. Three samples were presented at once in a randomised order on a mobile tasting booth. One technician was available to assist the pre-schooler group in conducting the test by explaining the procedure, asking for the answer and completing the questionnaire. For other groups, one technician was always available if participant had questions.

Participants were asked to taste the samples in the indicated order and to give the answer by checking the corresponding case on the scale. They were also served plain cookies and water to rinse between samples.

Finally, participants were asked if they love to drink milk. This question helps to divide participants into two groups, milk-likers and milk-dislikers, for further analysis. This classification based on children's self-report, rather than measure their consumption frequency, was to understand better preference of children towards these products.

2.5. Data analysis

To confirm performance of the 7-point facial hedonic scale on each age group, mean liking scores of UHT and UHT sweetened were compared using *t-student* test.

The comparison of mean liking score for pasteurised milk and UHT milk of children in each age group was performed using *t-student* test.

To understand better preference of the participants, effect of *age group* (pre-schooler/early-reader/pre-teen), *gender* (male/female), and *general milk liking* (milk-likers and milk-dislikers) was tested using an ANOVA calculated as follows:

$$\text{Liking Score} = \text{product} + \text{age group} + \text{gender} + \text{general milk liking} + \text{errors}$$

If there is any difference between means, Tukey paired comparisons were used to determine where differences are.

All the statistical data analysis was conducted by using XLSTAT version 2017.

3. RESULTS AND DISCUSSION

3.1. Performance of the 7-point facial hedonic scale in evaluating children preference

Table 1 showed liking comparison results between UHT and UHT sweetened milk samples within each age group. For all age groups, UHT sweetened milk sample was rated significant higher than UHT milk sample.

Table 1. Results of *t-student* test to compare mean liking scores between UHT and UHT sweetened milk samples.

Groups of participant	Mean liking score of UHT milk	Mean liking score of UHT sweetened milk	p value
Pre-schoolers	5.338	5.825	0.047
Early-readers	4.300	6.000	0.001
Pre-teens	3.759	5.525	0.001

There is extensive evidence that taste preferences are innate: infants at birth show a preference for sweet taste and rejection for bitter taste by showing positive or negative facial expressions [7]. By consequence using a sweetened control sample is to confirm if the children participating to the test understand the question and able to give an appropriate answer or to check on a case corresponding to their preference to the tasting sample.

The above results help to confirm that the 7-point facial scale using in this study is able to evaluate children preference to a food product from very young ages.

In addition, the difference of liking score between UHT and UHT sweetened samples is smallest in pre-schooler group and biggest in pre-teen group. This suggests that a greater mature of cognitive ability in children, a better performance of the scale.

3.2. Comparison of children preference towards pasteurised milk and UHT milk

Table 2 and Figure 2 showed liking comparison results between pasteurised and UHT milk samples within each age group. For all age groups, no difference was observed between liking scores of the two tested samples.

Table 2. Results of *t-student* test to compare mean liking scores between pasteurised and UHT milk samples.

Groups of participant	Mean of pasteurised milk	Mean of UHT milk	p value
Pre-schoolers	5.380	5.338	0.862
Early-readers	3.910	4.300	0.133
Pre-teens	3.410	3.759	0.061

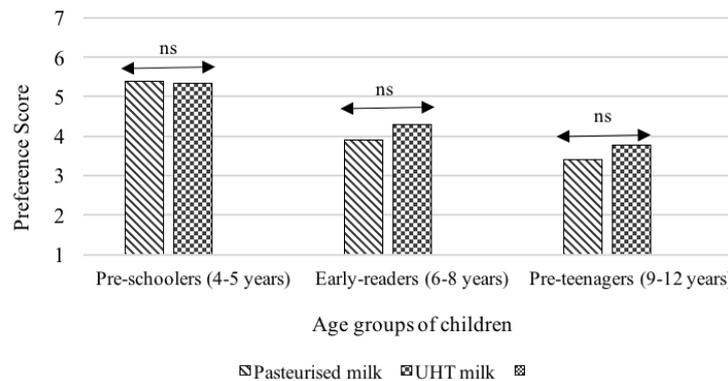


Figure 2. Comparison of children preference towards pasteurised and UHT milk (*ns* means non significant).

Children participated in this test showed no preference for a specific product between pasteurised and UHT milk samples. This observation could be explained by following reasons. First, the heating treatment process using by this local producer does not conduct to a significant difference between pasteurised and UHT milk in terms of sensory perception, at least for the tested children ages. Second, as a young consumption country for milk products, children in Vietnam are exposed equally to both pasteurised and UHT milk product, resulting in no preference for fresher milk properties as observed in traditional consumption country for milk [6].

3.3. Effect of age, gender, and general milk liking on children preference towards pasteurised and UHT milks

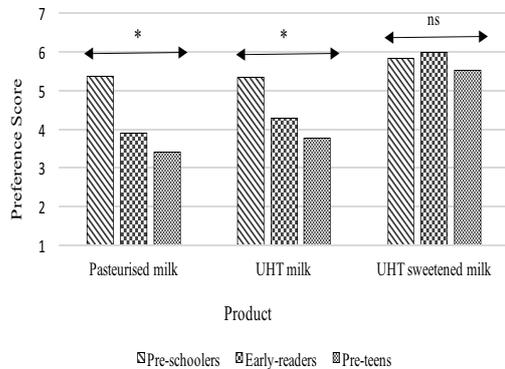


Figure 3. Effect of Age on children preference towards milk products. (ns means non significant, * means $p < 0.05$, ** means $p < 0.01$, *** means $p < 0.001$).

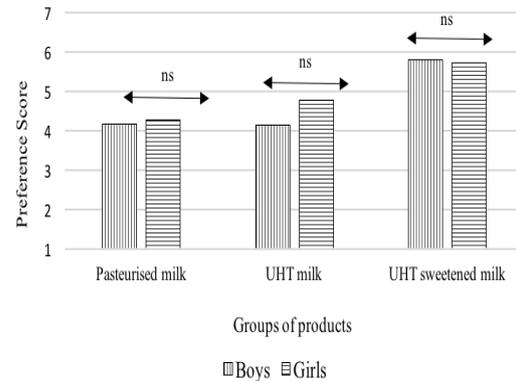


Figure 4. Effect of Gender on children preference towards milk products. (ns means non significant, * means $p < 0.05$, ** means $p < 0.01$, *** means $p < 0.001$).

Figure 3 represents the average liking scores for each product between age groups. The result of ANOVA showed an effect of *age* for pasteurised milk and UHT milk, but not for UHT sweetened milk. While different age group appreciated UHT sweetened milk at the same level, this is not observed for other products. In both case of unsweetened milks, pasteurised and UHT, pre-schoolers tend to give higher liking scores than other groups. Beside the effect of cognition ability as discussed previously, children of this group possess less developed food experience than other groups and milk still plays an important role in their everyday food regime. This may explain a better appreciation to unsweetened milks of pre-schoolers than other groups.

Figure 4 represents the average liking scores for each product between boys and girls. The result of ANOVA showed no effect of gender for all tested product.

Figure 5 represents the average liking scores for each product between milk-likers and milk-dislikers. The result of ANOVA showed a big effect of *general milk liking* for all tested product: significant higher liking scores were given for all products by milk-likers than milk-dislikers. These results confirm the important role of familiarity and attitude in shaping preference to food.

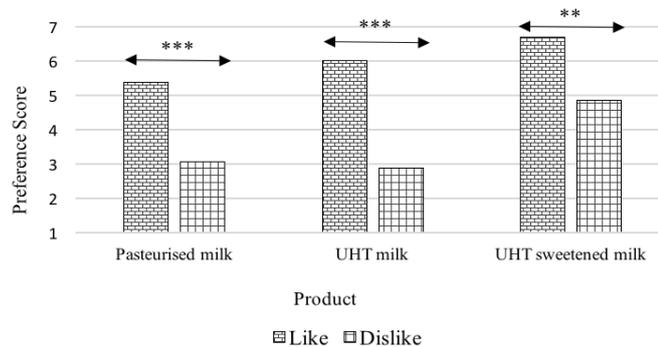


Figure 5. Effect of general milk liking on children preference towards milk products (ns means non significant, * means $p < 0.05$, ** means $p < 0.01$, *** means $p < 0.001$).

4. CONCLUSIONS

Findings of the current study can help to confirm efficient utilisation of the 7-point facial hedonic scale in evaluating children preference for a food product. Children from very young age (from 4 years old in this study) could be able to use the scale to differentiate their preference towards an UHT sweetened control milk sample and an UHT blank milk sample. In addition, no preference difference of testing children was observed between pasteurised milk and UHT milk. This information could be very valuable and helpful for milk producer as well as for children's parents. Further study on a wider of range of product and on sensory perception should be conducted for a better understanding of children preference towards pasteurised and UHT milks.

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TÓM TẮT

SO SÁNH THỊ HIẾU CỦA TRẺ EM ĐỐI VỚI SỮA THANH TRÙNG VÀ SỮA UHT SỬ DỤNG THANG ĐIỂM THỊ HIẾU MẶT CƯỜI 7 ĐIỂM: NGHIÊN CỨU TRÊN MỘT SỐ SẢN PHẨM SỮA TRÊN THỊ TRƯỜNG

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Đối với các nhà sản xuất thực phẩm và đồ uống hiện nay, trẻ em là một nhóm khách hàng mục tiêu rất quan trọng, đặc biệt trong ngành hàng sữa uống. Nắm bắt được thị hiếu của trẻ đối với tính chất cảm quan của các sản phẩm thực phẩm sẽ giúp cho các nhà sản xuất thành công trong việc đưa ra thị trường các sản phẩm phù hợp. Tại thị trường sữa uống Việt Nam, sữa thanh trùng và sữa UHT là hai lựa chọn chính của trẻ em. Quá trình gia nhiệt trong xử lý sản phẩm có thể làm cho tính chất cảm quan của sữa UHT khác với sữa thanh trùng và có thể dẫn tới việc trẻ em thích sữa này hơn sữa kia. Mục tiêu của nghiên cứu nhằm: i) đánh giá khả năng ứng dụng của thang điểm mặt cười 7 điểm trong việc đánh giá thị hiếu của trẻ em; và ii) so sánh mức độ ưa thích của trẻ em đối với sữa thanh trùng và sữa UHT. 240 trẻ tuổi từ 4 tới 13 đã tham gia vào nghiên cứu. Bộ sản phẩm đánh giá gồm 3 mẫu sữa uống thương phẩm: sữa thanh trùng không đường, sữa UHT không đường và sữa UHT có đường. Kết quả nghiên cứu đã chỉ ra trên tất cả các nhóm tuổi, sản phẩm đối chứng là sữa UHT có đường được ưa thích hơn sản phẩm còn lại. Điều này giúp khẳng định khả năng ứng dụng của thang điểm mặt cười trong việc đánh giá thị hiếu của trẻ em. Không có sự khác biệt nào về mức độ ưa thích của trẻ em đối với sữa thanh trùng và sữa UHT sử dụng trong nghiên cứu trên tất cả các nhóm tuổi. Điều này có thể được giải thích rằng sự khác biệt về tính chất cảm quan có thể có giữa 2 dòng sản phẩm không tạo ra sự khác biệt về thị hiếu ở trẻ em. Sự ảnh hưởng của lứa tuổi, giới tính và sự ưa thích chung với sữa của nhóm trẻ em tham gia nghiên cứu cũng được thảo luận.

Từ khoá: sữa thanh trùng, sữa UHT, thị hiếu của trẻ em, thang điểm thị hiếu mặt cười.