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Consumers ability to discern food quality under blind conditions

TITOLO
Abilità dei consumatori nel saper distinguere la qualità di un prodotto alimentare in assenza di informazioni

KEY WORDS
Milk, consumer behaviour, intrinsic quality, preferences, information

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Summary

Purpose: This study aims to investigate consumers ability to discern food product quality in absence of information compared to mass products. *Design/methodology/approach:* Milk types were selected in order to satisfy two dimensions: fat content and quality difference. Two experiments were run: in the first standardized or mass milks (Ultra-High-Temperature /UHT) were compared considering the fat dimension (3.5% vs 1.8%), whereas in the second experiment quality milks were compared according to quality attributes (Whole Fresh High Premium Quality Milk vs Raw Milk). In both experiments, consumers performed a triangle test and filled a computerized form indicating the odd milk, their preference, habits of consumption as well as demographic information. *Findings:* Consumers both inability and ability to spot the odd milk was not affected by preference or consumption habits. Results showed that in absence of information consumers easily detected high quality products rather than standardized or mass products. In fact, between standardized (UHT milk types) 64% of participants did not spot correctly the odd milk (p<0.01) whereas, when quality milks were compared, 63 % of participants detected correctly the odd one (p<0.01). *Conclusion:* What affects consumers milk preference and attitude is quality, in absence of information as well as products awareness. Therefore, the sector needs to highlight quality characteristics in marketing strategies.

Riassunto

Obiettivo: Il presente studio si pone come obiettivo primario di capire se i consumatori sono in grado di distinguere un prodotto di qualità da un prodotto di massa in assenza di informazioni. *Metodo:* Le tipologie di latte da mettere a confronto, sono state selezionate secondo due criteri principali: il contenuto in grassi e la qualità del prodotto. Due esperimenti sono stati condotti. Nel primo esperimento sono state confrontate due tipologie di latte standardizzato, tipico del consumo di massa (Ultra-High-Temperature/UHT) tenendo conto come carattere distintivo il contenuto in grassi (3.5% vs 1.8%). Nel secondo esperimento invece due tipologie di latte sono state comparate sotto l'aspetto qualitativo tenendo conto delle caratteristiche intrinseche del prodotto (Latte Fresco di Alta

Qualità vs Latte Crudo). In entrambi gli esperimenti i consumatori sono stati sottoposti ad un test triangolare. Oltre al prodotto diverso, la preferenza, le abitudini di consumo e informazioni di tipo demografico venivano rilevati a mezzo di un software. *Risultati:* L'abilità o l'inabilità di un consumatore a saper distinguere il campione differente nel test triangolare, non veniva in alcun modo influenzata dalla preferenza o dalle abitudini di consumo. I dati indicano che, in assenza di informazioni, i consumatori riescono facilmente a discernere tra un prodotto di qualità rispetto a un prodotto standardizzato o di massa. Infatti, quando i prodotti messi a confronto erano entrambi di massa (UHT) ben il 64% dei partecipanti non riesce a individuare il campione differente (p<0.01), mentre nel confronto tra la qualità ben il 63% dei consumatori riesce a distinguere il diverso (p<0.01) senza alcuna informazione. *Conclusione:* La qualità è un fattore che influenza il consumatore quando non dispone di alcuna informazione sul prodotto. Strategie di marketing nel settore del latte fresco, dovrebbero essere maggiormente incentrate sulla valorizzazione delle caratteristiche qualitative intrinseche dei prodotti stessi.

Introduction

What makes a consumer to indentify a quality product? This is an issue that many marketers tend to analyse everyday because quality is one of those concepts to which consumers attribute different meanings. Many studies, focused on the importance of food quality, demonstrated that quality dimensions and considerations are really important in any food purchase (1-7). However, the way consumers make food choice is complex. For this reason, marketing researchers are commonly interested in understanding how consumers form judgments of quality under uncertainty, such as purchase situation or lack of information (7). Consumers tend to get the best quality for a good price, but finding out the best quality is not so easy. Even supplying more information to consumers the problem can remain unsolved because information may be not taken into account or misinterpreted (7). Thus, consumers quality perception is determinant for the purchase act.

There is a general agreement that quality has an *objective* and *subjective* dimension. *Objective* quality includes product physical characteristics. Whereas *Subjective* quality is the quality as perceived by consumers. Furthermore, accordingly two different schools of thoughts, the subjective dimension has two approaches: *holistic* and *excellence*. For the *holistic* approach quality concerns all the desirable properties a product is perceived to have. The *excellence* approach goes along with the product-oriented quality (8) and suggests that products have desirable properties that consumers do not consider as part of quality (7). The goal is to educate consumers to recognize these properties that most of the time are intrinsic to the product. Intrinsic characteristics are strongly tied to food hedonic characteristics, including taste that repre-

sent a central dimension for consumers: the experience characteristic of a product that elicit expectations about the hedonic and in turns affect the purchase act (8). Thus, intrinsic quality cues rely to physical, technical, and physiological characteristics of the product. But, quality expectations are based also on information availability at the moment of the purchase act (9-10) representing the extrinsic cues which are all other characteristics such as brand name, packaging, price, and so on (8, 11).

However, previous studies demonstrated that mass or standardized productions exposed without brand, packaging, or description concerning internal cues, do not have such as this intrinsic characteristics able to induce consumers to make a defined choice and a precise evaluation. Whereas, foods strongly tied to the biodiversity factors are better evaluated and perceived in terms of quality thanks to their intrinsic components, easy to recognize by consumers in absence of information because of their sensory attributes (12).

Sensory attributes are perceived in different ways by consumers, but taste is the most relevant "experience characteristic". Organic consumers in a study showed a tendency to attribute a better taste to organic products, even if little scientific evidence exists concerning their superiority respect to commodity or conventional foods, especially for occasional consumers (13-14). This is the key point of the present study: taste experience and quality recognition based on intrinsic cues rather than external ones.

In fact, it has been demonstrated that when products are presented without labels or brands, consumers tend to evaluate products similarly even if products are different, or even when consumers are testing their favourite ones (15). Why this happens? Because consumers before the purchasing act strongly rely on external cues for their decision making. Cues that are able to affect consumers decisions since youth (16) generating quality expectation (7), usually inferred but not actually experienced.

According to some studies, quality perception is addressed by four universal dimensions: taste and appearance, health, convenience, and process (8) being quality a multidimensional concept arising from the variety of characteristics and attributes that a product owns (17). The key point is to understand what consumers perceive as quality products. Indeed, in order to evaluate a product consumers rely on cues they might disagree in different contexts of consumption on the quality of an identical product because the perceived quality can differ from the effective ones (18). Thus quality evaluation is for some aspects subjective and depends on many factors such as context, environment and information. However, we believe that some food products hold unmistakable quality and for this reason are easy to recognize, independently from the presence of external cues including visible information. These products most of the time, even if from a sensorial point of view might be more enjoyable than well known products, are inapt to elicit similar or strong emotions during the conscious consumption act (17), but can be more appreciated during the unconscious one.

Consumers in front of products without information are not able to spot their favourite food among standardized quality of mass products, but they might be able to distinguish among products with high intrinsic quality. Therefore, this study will try to answer to the following research questions:

Question 1: In absence of information supply, meaning external cues, are consumers able to recognize the odd product in a comparison among *standardized or mass products even when they are product frequent users?*

Question 2: In absence of information supply, meaning external cues, are consumers able to spot between *standardized and not stan-*

dardized products, characterized by intrinsic qualities, even when they are not product users?

Methodology

Products

Milk types were chosen in order to satisfy two dimensions: the first dimension consider milk fat content difference in mass standardized milk, whereas the second dimension consider quality differences between fresh pasteurised high quality milk and raw milk. In the first experiment, standardized or mass milks were those that underwent to the same UHT (Ultra-High-Temperature) heat treatment, with the same brand but with a different fat content whole and semi-skimmed.

Whereas in the second experiment, not mass products was the raw milk whereas standardized milk was the whole fresh high-premium quality milk (WFHPQ_Milk)[1], both characterized by specific intrinsic qualities. These were chosen in order to be as much similar as possible. In fact, both products were whole milks with equal fat content, with a different heat treat-

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[1] High premium-quality milk is not a commercial advertisement on the goodness of the product but a specific merchandise strictly ruled by the law n° 169 del 3/5/1989.

ment in fact the WFHPQ_milk undergoes to a gentle temperature pasteurization treatment that is the closest as possible to raw milk type that indeed is supposed do not have any type of heat treatment. For definition raw milk does not undergo to any heat treatment (Table 1).

Thus two different milks also branded differently were used in the second experiment. In order to be sure about raw milk safety, raw milk before data collection underwent to microbiological analysis. *Salmonella, listeria monocytogenes and E-coli* in all replicates resulted negative. Thus, raw milk safety was guaranteed before proposing the milk to consumers.

Procedure and Measures

For experiment 1 using standardized or mass milks, 4 replicates of 30 consumers for a total of 120 people were planned. For experiment 2 using standardized and not standardized milks 3 replicates of 33 consumers were planned. The number of participants in the two experiments was different because

we needed to strengthen the idea that between mass milk types does not exist any difference. To justify this hypothesis, it was necessary to reduce the error by increasing the number of participants in the first experiment (Exp 1).

In both experiments a triangle test (α=0.05, β=0.10, p_d =40%, π=0.33) was performed by consumers. By the master card of the Compusense® version 4.6 (19) sets of three small plastic glasses were prepared containing on average 25-30 ml of milk. Plastic glasses were labelled with a 3-digits random numbers. Per each set two glasses contained the same milk and one was different. Milk sets were presented to consumers in a randomized and counterbalanced order. No information at all was provided on the type of milk under analysis, as well as nobrand showed.

At the beginning of the session, written consent forms were gathered from participants. People either suffering from allergies or disliking milk were not included. In group of six, milk drinkers were invited to enter in the sensory lab

Table 1 - Products in Comparison per Experiment

Experiment		Products	Temperature C°	% Fat
Exp1	Standardized	Whole UHT	130-150°C 20 sec	3.5%
	Standardized	Semi-skimmed UHT	130-150°C 20 sec	1.8%
Exp 2	Standardized	WFHPQ_Milk	72-80°C 15 sec	>3.2%
	Not Standardized	Raw Milk	< 40°C	>3.2%

and to sit in front of a computer station. On the table, a set tray with 3 coded-plastic glasses containing milk was already disposed. Participants were required to follow the instructions indicated on the screen and to answer accordingly. As first indication, participants were invited to smell and taste milk samples in the order provided from left to right, trying to spot the odd one, providing the only indication that only one type was different among the three samples. Once the answer was gathered, then on the screen it was required to indicate which milk was the most preferred among the three samples already tasted. Consumers then indicated their consumption habits in terms of milk type use among "whole milk", "semi-skimmed milk", "skimmed milk" and "none of the above". In the second experiment this list raw milk was also included. Finally, consumers were required to insert demographic information such as gender, age, and profession. Dummy variables were used to analyse data[2].

Sampling

In the first and in the second experiment respectively a total of

113 (64% female, age= 29±11) and of 97 (50% female, age= 37±10) milk consumers participated at the study. Only milk drinkers were included in the analysis. People were recruited to participate in the study during a public event taken at the CoRFiLaC, a dairy research centre located in Ragusa (Italy).

Analysis of the Data

Data were collected by Compusense® version 4.6 (19) and analyzed using JMP 8.0.1 software (20). Data were analyzed according to one tail triangle test to asses the ability to spot the different product and preference. Binomial statistics and chi-square tests were applied to identify sensorial differences, correspondence between preference and consumption habits. Analysis was performed per replicate set of consumers and on the overall total number of consumers obtaining the same results. Tests were considered significant at a level of α=0.05.

Results

Variables such as sex, profession, and set order presentation did not affect our results (chi-square<2.70; p>0.05). For this reasons these variables will not be taken into account.

Question 1: Consumers ability to discern between standardized/mass milk types

Between UHT whole milk and UHT semi-skimmed milk overall consumers in the 64% of the cases did not spot correctly the odd milk (π=0.50; p<0.01). Exactly the same results were obtained in each replicate as showed in table 2 (Triangle test α=0.05, β=0.10, p_d=40%, π=0.33).

Thus, consumers independently from demographic factors and order of set presentation were not able to spot the odd milk between the two UHT milk types in comparison. Because this could depend on habits of consumption this was gathered per single participant and taken into account.

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[2] Procedural details for the present study and copies of the measurement instruments are available from the authors.

Table 2 - Exp. 1 Ability of consumers to spot the odd product between standardized whole UHT and semi-skimmed UHT milk (n=113) per replicate

Replicate	N.	Correct Answers	Incorrect Answers	Confidence	p-value
1	16	7	9	0.74	0.26
2	30	12	18	0.72	0.28
3	32	10	22	0.34	0.66
4	35	12	23	0.48	0.52

From declared consumption habits, data showed that 65% of participants consume the semi-skimmed milk, 23% are whole milk oriented, 8% indicate totally skimmed milk and only 4% indicate "none of the above options". Therefore, on average consumers were products users of both whole and semi-skimmed milk, but were not able to recognize the odd milk between the two in comparison.

The further key point was to demonstrate that preference was not related to declared consumption habits. In fact, when we asked consumers to indicate which milk they preferred the most, taking into account all participants in a blind condition, 63% significantly (n=113, π=0.50; p<0.01) indicated unconsciously UHT whole milk.

Thus considering data from triangle test per single replicate (α=0.05, β=0.10, p_d =40%, π=0.33) a similar result was found with the exception of the first one (Table 2a)

Besides, in 64% of the cases, habits of consumption and preference did not match (n=113, π=0.50; p<0.01).

Question 2: Consumers ability to discern between standardized and not standardized milk characterized by intrinsic qualities

Between raw milk (not standardized) and Whole Fresh High-Premium Quality Milk (standardized), overall 63% of the con-

sumers this time were able to spot correctly the odd milk (π=0.50; p < 0.01). Exactly the same results were obtained in each replicate as showed in Table 3 (Triangle test α = 0.05, β =0.10, p_d = 40%, π=0.33). Even in this case ability to spot the odd milk was not related to demographic factors and to consumers habit of consumption. Consumers declared to be in 54% of the cases semi-skimmed milk users, 26% were skimmed milk users, 15% whole milk users and only 3% were raw milk users. The remaining 2% indicated "none of the above options". On average consumers were not products users but were able to recognize easily

the odd milk between the two products in comparison.

Once again, the further key point to demonstrate was the lack of relationship between preference and declared consumption habits. In fact, when we asked consumers to indicate which milk they preferred the most, 75% of the participants significantly indicated to prefer WFHPQ milk (n=97, π=0.50; p<0.01). Once again, looking at the data per single triangle replicate (α = 0.05, β =0.10, p_d = 40%, π=0.33) a similar result was found in all replicates (Table 3a).

In the second experiment, in 94% of the cases, habits of consumption and preference did not match

Table 2a - Exp. 1 Consumers preference for UHT milk types (n=113) per replicate

Replicate	N.	Whole UHT Milk	Semi-skimmed UHT Milk	Confidence	p-value
1	16	8	8	0.90	0.10
2	30	19	11	0.99	<0.01[‡]
3	32	20	12	1.00	<0.01[‡]
4	35	24	11	1.00	<0.01[‡]

[‡] values are significantly different with a p<0.01

Table 3 - Exp. 2 Ability of consumers to spot the odd product between raw milk and WFHPQ[a] milk with intrinsic qualities (n=97) per replicate

Replicate	Number of participants	Correct Answers	Incorrect Answers	Confidence	p-value
1	35	25	10	1.00	<0.01[‡]
2	40	22	18	0.96	<0.01[‡]
3	22	14	8	0.99	<0.01[‡]

[a] WFHPQ= Whole Fresh High-Premium Quality milk.
[‡] values are significantly different with a p<0.01

Table 3a - Exp. 2 Consumers preference for WFHPQ= Whole Fresh High-Premium (n=97) per replicate

Replicate	N.	WFHPQ[a] Milk	Raw Milk	Confidence	p-value
1	35	27	8	1.00	<0.01[‡]
2	40	22	18	0.99	<0.01[‡]
3	22	12	10	0.96	<0.05[†]

[a] WFHPQ= Whole Fresh High-Premium Quality milk.
[‡] values are significantly different with a $p<0.01$.
[†] values are marginally significant with a $p<0.05$.

(n=97, $\pi=0.50$; $p<0.001$), implying that on average people were not product users but strongly tended to prefer the premium quality whole milk very far away in terms of quality from the semi-skimmed type.

Discussion

Even though milk and milk products intake in a sufficient amount is recommended for health of humans, consumers' fluid milk consumption is bizarre. In Italy, in the last decade cow drinking milk production and consumption decreased respectively of 7% and 14%, respectively, although the magnitudes differ for specific fluid milk types[3]. In the first four months of 2010, family UHT milk consumption represented the 54% of total selling, the whole fresh premium-quality milk represented the 14% of the total selling,

pasteurized fresh milk the 26%, and the remaining 6% was represented by functional milk types[4]. As showed by national data concerning Italy provided by CLAL in 2011, the most frequent milk purchase and consumption is oriented to UHT type. The high market share of the UHT milk might be attributed to the expectation that consumers have on the safety and quality of this type of milk especially in the semi-skimmed form. There are several reasons explaining why consumers prefer to purchase processed fluid milk rather than unprocessed fluid milk. Usually, the preference is driven by the cost. Processed fluid milks are cheaper than processed fluid milk as its supply involves fewer costs, because of its guarantee of quality, long shelf-life and packaging to carry and store (21). Participants in this study declared to consume semi-skimmed milk reasoning that this type of milk is

easier to digest. This is a misconception attributable to information misinterpretation. On the base of consumers' declarations, two comments at this key point are needed. First of all, consumers use semi-skimmed milk, declare to prefer it, but are not able to recognize it. Their declared preference is mainly tied to habits of consumption and credence information rather than on experienced actual taste pleasantness as showed in our analysis. In fact in both experiments, people preferred the whole milk with a richer taste. This is attributable to the higher presence of fat content that plays an important role in determining flavour and palatability (22). Dairy fats are particularly palatable because of the large number of small molecular size lipids. In specific, milk lipids contain a wide range of short-chain fatty acids (butirric, capronic, caprilic, and caprinic) that are volatile molecules and thus perceptible as aroma, flavour and mouth feel (23). Surely, flavour is the most crucial concept for defining quality (24).

Once the fat content is reduced (as in the semi-skimmed milk), these molecules are not available anymore and in general milk turns out less tasty than the whole (raw) one (25). Removal or reduction of lipids lead to unbalanced flavour, and according to Ingham et al. (26) this happens because the non-polar

[3] http://www.clal.it/index.php?section=quadro_italia
[4] http://www.clal.it/index.php?section=consumi&p=latte

volatiles are no longer dissolved in the lipid phase and released from the food product as soon as eating begins (26). Milk fat has texture, taste and flavour commonly perceived as positive, but for the presence of cholesterol and a large quantity of saturated fatty acids it has acquired a negative health reputation for consumers (27) when they are aware of it.

Consumers are not able to form correct hedonic expectations of food quality because they use cues which are weakly related to hedonic quality and often strongly rely on misinterpreted information (8). The use of extrinsic cues depend on the extent to which consumers believe these to be a quality indicator, thus it depends on cues credibility (8).

For instance, in a study of food expectation based on steak evaluation, steaks with the highest expectations were the least liked. Expectations were generated by more visible fat presence unconsciously associated by consumers with lower quality (6-7) whereas the most liked then resulted those with higher fat content. In the present study a similar result was showed for preference which was also in favour of a higher fat milk content. This result that might appear unexpected is justified by the fact that higher degree of fat lead to more taste (28-29) and this is even true for whole fresh milk.

Besides, temperature treatment affects milk taste. The UHT treatment tend to reduce enzyme content, because protein denature upon heating above 70°C, high temperature lead to a cooked milk flavour formation typical of the UHT milk. All this causes a lower presence of aromatic compounds (27, 30).

The second comment we would like to make is that consumers misconception about their capacity to digest better semi-skimmed milk is strongly related to milk fat content knowledge. Actually, better digestion does not depend only on fat content. An healthy organism is able to digest any kind of food. Inability do digest milk concerns a lactase deficit, an intestinal enzyme that allows to divide and to absorb the most important sugar component in milk that is the "lactose". Lactose maldigestion affects about 75% of the worldwide population (31, 32). Lactose intolerance is common in many adults and is caused by deficiency of intestinal lactase (33). Thus the most important thing for each person is to establish individual milk tolerance in order to avoid to totally eliminate milk from a diet. Ingesting milk with a meal may be a good thing to improve tolerance (33). Unfortunately consumers misconception about milk digestiveness was not gathered quantitatively, but was based on verbal declarations. This represent a limit of the present study. To improve our results it would be interesting to arrange a further experiment in which also this aspect would be taken into account.

Thus, information and marketing communication strategies create consumers belief and expectations as visible external cues, damaging in some cases quality products that until when products are not experienced cannot be correctly appreciated. In order to help the market of fresh milk, producers should identify the objective and subjective categories of the intrinsic quality and the connections between them in order to supply the market with food suitable to consumers wishes. Raw milk and high-quality fresh milk need a market share enlargement, and this might be obtained thinking about new market communication strategies that might lead consumers to buy good quality products. Consumers need to be educated to recognize quality characteristics and this will be the key strategy for food products valorisation (12, 17). This study should be useful in understanding consumer preference for fluid milk choices which will help sellers and marketing participants to formulate appropriate marketing strategies that successfully can target segments of consumers looking for intrinsic quality and not for appearance.

There exists a need of product repositioning based on flavour richness, higher quality and hedonic enjoyment supported by educational strategies on milk quality recognition. This might lead to higher consumer involvement and loyalty.

Conclusions

This study has revealed that consumers in blind conditions in lack of external cues are not able to distinguish between mass standardized products with different fat content, but easily detect the odd milk between standardized and not standardized quality products. This implies that there are certain types of food that own intrinsic quality characteristics that people might appreciate and evaluate positively if no external cues are provided. Unconscious preference and decision making differ from conscious ones. Thus, to match these two it is necessary to educate consumers to distinguish among typical food characteristics because as it was found out, in lack of information quality affects consumers milk preference and attitude is quality. Therefore, the sector needs to strengthen quality characteristics in new marketing strategies.

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