

Consumers' expectations and acceptability for low saturated fat 'salami': healthiness or taste?

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Abstract

BACKGROUND: Nutritional properties of meat and meat products are becoming very important in purchasing behaviour, because consumers are even more concerned about healthiness. The present study aimed to examine the influence of health information on the expected and informed acceptability of salami. Traditional salami and two low saturated fat salami produced with partial or total substitution of pork backfat with extra virgin oil were evaluated.

RESULTS: Perceived acceptability was the lowest in salami with total animal fat substitution. In both low saturated fat salami, expected acceptability was significantly higher than perceived acceptability, while in traditional salami it was lower. Consumers completely assimilated their liking in the direction of expectations for salami with partial animal fat substitution, whereas incomplete assimilation was observed for salami with total animal fat substitution. The results also revealed that some sociodemographic characteristics discriminate consumer clusters from each other.

CONCLUSION: The present study highlights that nutritional information is not enough to satisfy consumers' expectations if the product is not sensorily acceptable. Findings about the relevance of information and consumers' segmentation could have important implications for policy makers and the meat product industry.

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Keywords: low saturated fat salami; sensory properties; consumer expectations; informed acceptability; consumers' segmentation

INTRODUCTION

Food demand is influenced by many and heterogeneous drivers and is characterized by continuous evolution over time, because consumers are becoming more different in their quality perception.¹ The provision of quality signals such as information, labelling, advertising claims and warranties can transform some attributes (place of origin, healthiness, ethic concerns, organic, etc.) classified as 'credence attributes' (because they cannot be verified even after consumption of the food product) into 'search attributes' (whose presence can be verified by consumers before purchase).^{2,3} Information about healthiness could be used by consumers as a quality signal influencing their expected acceptance of food products^{4,5} and increasing their motivation to try them. The result of the interaction between information and consumers' attitudes and beliefs can influence the perceived healthiness, leading to differential changes in sensory ratings of labelled stimuli products.^{6–8}

The correlation could be positive, but in some cases it could result in a lower or negative expectation of the sensory experience.⁹ Currently, food companies consider information about healthy characteristics as part of their marketing strategy, following increasing concerns about the potential health risks associated with food consumption, particularly in high income countries. This has led researchers to study the possibility of modifying food products by adding ingredients considered

beneficial to health or by eliminating or reducing components that are considered harmful (fat, salt, sugar, alcohol, etc.). Research findings and consumers' health concerns related to the association between the fat content in red meat products and the effect on cholesterol levels and cancer risk have had a negative effect on consumer perception of the healthiness of meat products¹⁰ and consequently have stimulated industrial interest in developing healthier products with low saturated fatty acids. Manufacturing and marketing of such novel products could benefit the image of the meat product sector,¹¹ taking into account the relevant role played by information in influencing consumers' preferences.^{12,13} However, the way consumers perceive information, strongly affected by personal attitudes, could turn health information into a negative expectation barrier and reduce the hedonic value to purchasers.^{14,15} As reported by Fernández-Ginés *et al.*,¹⁶ the use of some ingredients for adding functional properties to meat products sometimes results in lower sensory and physicochemical quality. Such differences in consumers' reactions could make it

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Table 1. Attributes and reference frame used for quantitative descriptive sensory analyses

Attribute	Definition	Intensity	
		Low	High
<i>Appearance</i>			
Colour uniformity	Presence of a darker external halo in the slice due to anomalous drying process	Two month seasoned sausages ²⁶	Bresaola ²⁶
Cohesiveness of the slice	Degree to which salami can be deformed before the first bite	Cubed cooked ham ²⁶	Dry sausage ²⁶
<i>Flavour and taste</i>			
Global flavour	Intensity of the sum of all flavours	Fifteen day seasoned sausage ²⁶	Napoli salami ²⁶
Rancidity	Intensity of rancid odour perception of the sample during chewing	Bacon fat	Oxidized backfat at 50 °C for 24 h
<i>Texture</i>			
Greasiness	Perception of oil or fat in the mouth when chewing	Cubed dry-cured ham ²⁶	Cubed pancetta ²⁶
Hardness	The force required to bite the sample with the molars	Cubed Hungarian salami ²⁶	Two month seasoned cubed sausages ²⁶
Moisture	The amount of wetness felt in the mouth after the first bite	Dry sausage	Cooked ham

difficult to set up effective marketing strategies for companies planning large-scale production of novel healthy foods, as in the case of low saturated fatty acid meat products.

The aim of this study was to analyse the effect of information on consumers' preferences for an innovative meat product with healthy properties, an Italian salami with low saturated fat content. The assessment of the acceptance by consumers of Italian salami with healthy ingredients has been analysed in previous studies, considering the addition of probiotic cultures,¹⁷ the reduction of sodium chloride by replacing it with combinations of potassium chloride and calcium chloride,¹⁸ the addition of canola oil¹⁹ and the use of propolis as a replacement for the synthetic antioxidant sodium erythorbate.²⁰ Following on from results of a previous study concerning technological aspects of the replacement of pork backfat with extra virgin olive oil in typical Italian salami to produce a healthier product,²¹ the present work considers consumers' evaluation of this product in terms of expectation induced by information and sensory experience. To achieve this purpose, a sensory expectation model has been applied¹² which refers to assimilation/contrast theory to explain the discrepancy, if any, between expectation and actual experience in consumers' evaluation of the product. Such an approach, based on three consecutive steps (blind, expected and informed acceptability), allows the assessment of relationships between consumers' expectations (conditioned by physiological and psychological aspects), information and sensory perception.^{22,23} Segments of consumers who differed in the information/sensory relationship evaluation were also identified.

EXPERIMENTAL

Products

Three different salami formulations were prepared in a meat processing company (Carni SUS, Foggia, Italy) using an industrial process. Traditional salami (TS) was produced using 90% pork meat of autochthonous breed (Apulian black pig) and 10% pork backfat, whereas low saturated fat 'salami' were produced by substitution of pork backfat with 60 and 100% of whey protein soaked in extra virgin oil for 30 min (SS60 and SS100 respectively) as described by

Del Nobile *et al.*²¹ in a previous study. After ripening time, all samples (30 salami for each formulation) were collected for descriptive sensory analysis and consumer testing. Animal fat or olive oil was added to achieve 31.50% of fat content in TS and 25.45 and 22.64% of fat content in SS60 and SS100 respectively. Saturated fatty acid content in TS was 43.37%, whereas in SS60 and SS100 it was 28.55 and 23.81% respectively.

Panel training and quantitative descriptive sensory analysis

An eight-member trained panel performed the sensory analysis. The assessors were selected for their sensory ability and their previous experience in performing sensory profiling on other cured meat products (hams and sausages). Six preliminary sessions were performed to develop the list of attributes and their definition and to train panellists in attribute intensity evaluation and scale use.²⁴ The sensory definitions and references for each attribute are shown in Table 1.

A quantitative descriptive sensory analysis²⁵ was used to assess the three different salami formulations. Tests were performed in a sensory analysis laboratory equipped with individual booths and under red lighting to mask colour differences in the samples, except during the evaluation of salami appearance, when white fluorescent lighting was used. For every session, salami samples from the three different formulations were offered to each panellist. Samples were coded with a three-digit random number, and two slices (4 mm thick) of each salami were served to every panellist in random order according to sample. During sensory evaluation, panellists were asked to drink a sip of still water (at room temperature) and to eat unsalted crackers between samples to purge the palate of residual flavour. The panellists rated the attributes on the basis of 100 mm unstructured lines with anchor points at each end (0 = absent and 100 = very strong) as reported by Braghieri *et al.*²⁶

Consumer test

Consumer survey and experimental design

In order to set up the consumer test, 250 consumers were recruited in the towns of Foggia and Bari (Apulia region, southern Italy). All subjects were interviewed and were asked about their frequency

of consumption of cured meat products at home (1 = never; 2 = once a year or less; 3 = three to five times a year; 4 = at least once a month; 5 = more than two times a month; 6 = at least once a week) and their food-related lifestyle (e.g. importance of product information, consumption of fatty products). One hundred and ninety-six consumers were selected using predetermined screening criteria based on consumption of cured meat products with a frequency of at least once a month.

Before participating in the study, all consumers were informed about the presence of milk or milk-derived products in the salami and signed a written consent form stating the participants' expected contribution and rights, including the right to opt out during the research period; moreover, they were paid for their time.

The experiment was planned in three tests which differ for stimulus presentation, type of evaluation and type of rating. At the beginning of each evaluation, oral instructions were given to consumers about how to conduct the test. In addition, consumers completed a form with personal data and some questions about their consumption habits of fatty food. All samples were sliced and then offered to the subjects in individual booths, located away from the sample preparation area. Each sample was assigned with a three-digit random number, and one slice (4 mm thick) of each type of salami was presented to each consumer. A glass of a still water and unsalted crackers were provided to each consumer to cleanse the palate between sample evaluations.

Perceived, expected and informed acceptability

In the first test, TS, SS60 and SS100 in a balanced order of presentation were offered to each consumer. They were asked to taste the salami and to rate their liking receiving no information on the products (perceived acceptability). In the second test, the subjects received only a sheet with information concerning the nutritional properties of the products (traditional, partial and total substitution of fat) and their effects on human health. They were asked to carefully read the information and to give their liking expectation for the products (expected acceptability). The first and second tests were performed on the same day. The day after, the third test was performed: the consumers received all types of salami (TS, SS60 and SS100) together with the information sheet. They were instructed to read the information before tasting the sample and invited to express their liking (informed acceptability). Consumers rated their liking on a nine-point hedonic scale labelled at the left end with 'extremely unpleasant', at the right end with 'extremely pleasant' and at the central point with 'neither pleasant nor unpleasant'.

In tests 2 (expectations generated by information) and 3 (acceptability generated by information and by tasting the product), the following information concerning the nutritional properties and their effects on human health was given to consumers.

1. Traditional salami TS: salami manufactured with pork backfat using traditional protocol. This product has about 32% of fat with more than 43% of saturated fatty acid content.
2. SS60: salami manufactured with partial (60%) substitution of pork backfat with extra virgin olive oil (low saturated fat salami). This product has 25% of fat with 28.5% of saturated fatty acid content and good nutritional indices (atherogenic and thrombogenic indices and polyunsaturated/saturated ratio reach the recommended threshold values).
3. SS100: salami manufactured with total (100%) substitution of pork backfat with extra virgin olive oil (very low saturated

fat salami). This product has 23% of fat with about 24% of saturated fatty acid content and very good nutritional indices (atherogenic and thrombogenic indices and polyunsaturated saturated ratio reach values lower than the recommended thresholds).

Statistical analysis

Data were analysed using the GLM procedure of the SAS statistical software.²⁷

Preliminary analysis of variance (ANOVA) was carried out for each attribute to monitor panel performance using assessor, product, replication and the interactions as factors. Subsequently, sensory profile data were subjected to ANOVA with product as fixed effect; when significant differences were found (at $P < 0.05$ unless noted otherwise), the Student's t test was used to locate significant differences between means.

ANOVA was carried out using the MIXED procedure of the SAS system for perceived (P), expected (E) and informed (I) liking with product as fixed effect and consumer included as a random effect. To evaluate the effect of information on the consumer acceptability, the difference between expected and perceived liking scores (E–P) as well as the differences between informed and perceived liking scores (I–P) and between informed and expected liking scores (I–E) were calculated. Paired t tests were then performed in order to establish if those differences were significantly different from zero.²⁸ Clusters were performed by agglomerative hierarchical clustering (AHC) using the Euclidean distance with Ward's method as aggregation criterion. The number of clusters was selected from the dendrogram. Sociodemographic consumer data and additional questions were summarized using the FREQ procedure and statistical differences were tested using the chi-square (χ^2) statistical test of the SAS system, when appropriate. The level of significance was set at 5% ($P < 0.05$) in all cases.

RESULTS AND DISCUSSION

Descriptive sensory analysis

Preliminary ANOVA showed that the interactions product \times replication and product \times assessor were not significant, highlighting ability to discriminate, reproducibility and consistency among assessors. The salami sensory profile is reported in Table 2. The percentage of fat replacement significantly affected the sensory evaluation. Concerning appearance and texture attributes, salami manufactured with 100% replaced fat (SS100) showed the lowest colour uniformity ($P < 0.01$), cohesiveness of the slice ($P < 0.01$) and hardness ($P < 0.001$) and the highest moisture ($P < 0.01$) and greasiness ($P < 0.05$) compared with TS and SS60. In addition, trained panellists perceived a lower overall flavour intensity in SS100 ($P < 0.05$) compared with other salami. The highest score for moisture could be due to the excess of olive oil in the mixture that did not become completely enclosed inside but collected under casings. As a consequence, in SS100, the slice appeared heterogeneous and the salami showed bad sliceability and casing separated from fermented meat. Even if the highest moisture of SS100 negatively affected its appearance, on the other hand, this parameter accounted for texture attribute giving rise to a more tender product.

No significant differences between TS and SS60 were found except for hardness, which showed a lower value in SS60 than in TS, in agreement with previous studies^{21,29} that found an acceptable

Table 2. Effect of fat replacement on sensory profile of salami manufactured with traditional formulation (TS) and with partial (SS60) and total (SS100) substitution of pork backfat

Attribute	TS	SS60	SS100	SEM	Effect (<i>P</i> value)
Colour uniformity	7.51a	7.06a	6.04b	0.25	**
Cohesiveness of the slice	7.42a	7.00a	6.012b	0.28	**
Global flavour	7.30a	6.95a	6.08b	0.24	*
Rancidity	4.55	5.01	5.11	0.22	NS
Greasiness	6.11b	6.30b	7.02a	0.18	*
Hardness	6.83a	5.95b	5.22c	0.21	***
Moisture	5.95b	6.57b	7.50a	0.22	**

Values are mean \pm standard error of mean (SEM). NS, not significant; **P* < 0.05; ***P* < 0.01; ****P* < 0.001.

Table 3. Acceptability scores for perceived, expected and informed tests and their score differences by different 'salami'

Salami	Perceived liking	Expected liking	Informed liking	E–P	I–P	I–E
TS	6.70 \pm 0.16b	6.09 \pm 0.10c	6.91 \pm 0.11	–0.61*	0.21NS	0.82
SS60	6.50 \pm 0.14b	7.18 \pm 0.13d	6.97 \pm 0.12	Positive disconfirmation ^a 0.68**	0.47*	–0.21NS
SS100	6.05 \pm 0.12a	7.27 \pm 0.15d	6.74 \pm 0.14	Negative disconfirmation ^b 1.22***	Assimilation ^c 0.69*	Complete ^d –0.53*
				Negative disconfirmation ^b	Assimilation ^c	Incomplete ^e

Values are mean \pm standard error. Different letters in a column indicate significant differences at (a, b) *P* < 0.05 or (c, d) *P* < 0.001. E, expected liking mean score; P, perceived liking mean score (baseline); I, informed liking mean score (with information). NS, not significant; **P* < 0.05; ***P* < 0.01; ****P* < 0.001.

^aThe product experience is better than expected.

^bThe product experience is worse than expected.

^cInformed liking moves towards expectations.

^dAssimilation occurs and informed liking is not different from expectations.

^eAssimilation occurs but informed liking is lower than expectations.

appearance and very soft texture for salami with pork fat replaced with olive oil.

Comparison between different information conditions on salami acceptability

Table 3 shows the results of perceived, expected and informed acceptability of salami. No differences between control salami and salami with 60% olive oil were observed for perceived acceptability, whereas salami with 100% olive oil showed the lowest value (*P* < 0.05). Both modified salami showed higher expected acceptability than control salami (*P* < 0.001). In both modified salami, the expected acceptability was significantly higher than the liking expressed in blind conditions (*P* < 0.01), whereas in TS the expected acceptability was significantly lower (*P* < 0.05), thus indicating that a disconfirmation took place in both cases. In particular, consumers perceived control salami better than expected (positive disconfirmation), whereas they found modified salami worse than expected (negative disconfirmation). Therefore information about nutritional properties had a marked impact on consumer expectancy; indeed, healthy products are associated with expected high quality. This result is in agreement with previous studies³⁰ that found nutritionally modified products highly acceptable, both when consumers try them for the first time and under conditions of repeated use over time.

For 60 and 100% modified salami, the informed liking was higher compared with blind acceptability (*P* < 0.05): the actual liking moves towards the expectations, thus indicating that information affects the actual liking of the product. The effect of information

can be explained on the basis of the assimilation model, which appears when the informed liking of the product moves in the direction of the expectations, as also shown in previous studies on consumers' behaviour.^{7,31} In the present study, the information about healthiness of modified salami generated a positive impact on actual liking even if the expectancy for SS100 salami was significantly higher than the actual liking (*P* < 0.05), highlighting that consumers did not completely assimilate their liking in the direction of expectations for this modified product. The incomplete assimilation observed for this product could be due to the influence of the sensory properties of salami in the determination of the actual liking. Indeed, if the product is not acceptable in terms of sensory properties, information about nutritional characteristics could not be enough to induce consumers to gain a more positive perception of the product and to increase its acceptability. This result highlights that taste is the main barrier in making healthy food choices by consumers who are not willing to exchange food taste for health benefits according to a previous study.³² In addition, we suppose that if the expected liking was much greater than the perceived liking, it could not be easy to move the totally informed liking towards the expected liking level. Previous studies suggested that if consumers do not completely assimilate the discrepancy between their expectation and actual product quality, they should revise their expectations after repeated exposure.^{8,31} The lack of any assimilation for control salami could be attributed to consumers' opinion that a normal salami contains high saturated fatty acids. Consequently, although information concerning control salami affected the expected acceptability of this product, the effect of the sensory property linked to consumers' aptitude

Table 4. Sociodemographic characteristics of consumers and additional questions about consumption and preference regarding healthy food

Consumer characteristic	Total		Cluster 1		Cluster 2		Cluster 3		Effect (P value)
	n	%	n	%	n	%	n	%	
<i>Gender</i>									
Male	92	46.9	27	49.1	19	40.4	46	48.9	NS
Female	104	53.1	28	50.9	28	59.6	48	51.1	
<i>Age</i>									
18–35	87	44.4	31	56.4	15	31.9	41	43.6	NS
36–59	85	43.4	19	34.5	25	53.2	41	43.6	
>60	24	12.2	5	9.1	7	14.9	12	12.8	
<i>Activity</i>									
Employed	109	55.6	28	50.9	25	53.2	56	59.6	NS
Student	80	40.8	24	43.6	20	42.6	36	38.3	
Unemployed	7	3.6	3	5.5	2	4.3	2	2.1	
<i>Consumption of cured meat products</i>									
Several times a month	45	23	29	52.7a	9	19.1b	7	7.4c	***
Several times a week	120	61.2	22	40.0c	34	72.3a	64	68.1b	
Daily	31	15.8	4	7.3b	4	8.5b	23	24.5a	
<i>Do you try to avoid fatty food?</i>									
No	71	36.2	24	43.6a	13	27.7c	34	36.2b	*
Yes	125	63.8	31	56.4c	34	72.3a	60	63.8b	
<i>Do you read the label carefully?</i>									
No	77	39.3	27	49.1a	14	29.8c	36	38.3b	*
Yes	119	60.7	28	50.9c	33	70.2a	58	61.7b	

NS, not significant; * $P < 0.05$; *** $P < 0.001$.

prevailed on the effect of information in the determination of informed liking.

Cluster analysis results

Cluster analysis was applied to classify respondents according to their acceptability scores. Consumer segments were identified highlighting a number of differences which can be explained with regard to sociodemographic characteristics of respondents and to their consumption and purchase habits. Table 4 reports the sociodemographic characterization of the selected consumers for the whole sample and for the three clusters identified on the basis of their responses. Among the three clusters, no differences were observed in gender, age and activity, while significant differences were found for product information prior to purchase ($P < 0.05$) and for consumption of cured meat products ($P < 0.001$) and fatty food ($P < 0.05$).

The first cluster, representing 28.06% of the sample, consisted of consumers who eat meat products several times a month (52.7%), aged 18–35 years. Members of this group may be regarded as 'occasionally meat product consumers', therefore less able to identify differences among meat products. Moreover, this group evidenced the highest percentage of respondents not trying to avoid fatty food (43.6%) and not carefully reading labels (49.1%), if compared with other clusters, showing less interest in health concerns.

As shown in Table 5, in the blind test, the consumers of this group perceived TS and SS100 in the same way, while they revealed the highest perceived liking ($P < 0.05$) for salami with 60% of fat substitution. The score recorded by SS60 in this group is also the highest when compared with clusters 2 and 3 in the blind test. All products generated expectations, and, in particular, in both modified salami the expected acceptability was significantly higher than the liking

expressed in blind conditions ($P < 0.01$), while in control salami the expected acceptability was significantly lower ($P < 0.05$). This indicates that a disconfirmation took place in both cases, consistently with data exposed in Table 2. Although product information affected consumers' liking, a lack of assimilation was observed during the informed acceptability test. Respondents of this cluster have the lowest familiarity with meat products in the three clusters. Consumers who eat meat with a lower frequency may likely be less appropriate to evaluate meat sensory characteristics by relying on intrinsic cues; in fact, they have high expectations, as demonstrated by high scores in expected liking for SS60 and SS100. The relevance of extrinsic cues in evaluating quality characteristics for consumers with low familiarity with a product, which results in uncertainty and clear difficulty in quality appraisal, is underlined in past studies.^{33,34}

The second cluster, representing 23.98% of consumers, was composed of people who eat cured meat products several times a week in almost 72.3% of cases. The group presented the highest percentage of members with an inclination to healthy food (72.3%) and to read product information (70.2%), if compared with other clusters. As a consequence, these consumers could be typecast as 'healthy food lovers', because they like to eat meat but prefer to avoid fat and they are used to reading food labels carefully. In the blind test, consumers revealed the same preference for both SS60 and SS100 and a slightly higher score for TS. It is noteworthy that SS60 and SS100 scores for expected acceptability were higher than TS scores, showing the higher consumer expectation for 'healthy' salami with reduced backfat (negative disconfirmation). In all modified salami, complete assimilation was observed; indeed, informed liking was higher than perceived, indicating that information affects the actual liking of the product. In this cluster, moreover, there were no significant differences for TS in all

Table 5. Acceptability scores for perceived, expected and informed tests and their score differences by different 'salami' per cluster

Salami	Perceived liking	Expected liking	Informed liking	E–P	I–P	I–E
<i>Cluster 1, n = 55</i>						
TS	6.51 ± 0.11b	5.95 ± 0.13b	6.81 ± 0.12	–0.56* Positive disconfirmation ^a	0.30NS	0.85
SS60	6.91 ± 0.12a	7.56 ± 0.12a	7.15 ± 0.14	0.65** Negative disconfirmation ^b	0.25NS	–0.41
SS100	6.55 ± 0.13b	7.81 ± 0.12a	6.88 ± 0.14	1.26*** Negative disconfirmation ^b	0.34NS	–0.93
<i>Cluster 2, n = 47</i>						
TS	6.41 ± 0.14	6.25 ± 0.13b	6.95 ± 0.14	–0.16	0.54	0.70
SS60	6.10 ± 0.13	6.93 ± 0.14a	6.85 ± 0.12	0.83** Negative disconfirmation ^b	0.75** Assimilation ^c	–0.08NS Complete ^d
SS100	6.05 ± 0.13	7.29 ± 0.13a	6.95 ± 0.14	1.24*** Negative disconfirmation ^b	0.90** Assimilation ^c	–0.33NS Complete ^d
<i>Cluster 3, n = 94</i>						
TS	7.19 ± 0.12a	6.05 ± 0.13b	7.05 ± 0.13a	–1.12** Positive disconfirmation ^a	–0.11	1.01
SS60	6.51 ± 0.12b	7.14 ± 0.13a	7.05 ± 0.14a	0.63** Negative disconfirmation ^b	0.54* Assimilation ^c	–0.09NS Complete ^d
SS100	5.60 ± 0.12c	7.00 ± 0.13a	6.55 ± 0.13b	1.44*** Negative disconfirmation ^b	0.94** Assimilation ^c	–0.49* Incomplete ^e

Values are mean ± standard error. Different letters in a column indicate significant differences at (a, b) $P < 0.05$ or (c, d) $P < 0.001$. E, expected liking mean score; P, perceived liking mean score (baseline); I, informed liking mean score (with information). NS, not significant; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

^aThe product experience is better than expected.

^bThe product experience is worse than expected.

^cInformed liking moves towards expectations.

^dAssimilation occurs and informed liking is not different from expectations.

^eAssimilation occurs but informed liking is lower than expectations.

tests, so it is important to highlight that this product is the only one not influenced by information. These results evidence that for health-conscious consumers of this group the provision of information about healthy salami deserved attention. In other words, they were experienced in meat consumption and already knew traditional salami, so providing information did not add anything new; on the other hand, SS60 and SS100 were new products presenting characteristics they were interested in, so the provision of information was worthwhile because they were more prone to safeguard their health.

The third cluster was the largest, representing 47.96% of the whole sample. It was characterized by the highest frequency of cured meat consumption (68.1% several times a week and 24.5% daily). These so-called 'cured meat product lovers' were interested in carefully reading labels of products, and almost two-thirds of them declared to avoid fatty food. In particular, in the blind test, consumers were able to perceive significant differences among all tested salami, recording the highest acceptability for TS ($P < 0.001$). Such results could be the consequence of their greater confidence with the product, confirmed by the highest score recorded by TS compared with other groups. In the expected test, information about healthiness generated a similar expectation for both modified salami (SS60 and SS100) which is higher compared with the traditional product, so showing an interest in health concerns. On the other hand, when we look at the informed test, consumers changed their opinion for SS100, showing incomplete assimilation ($P < 0.05$). This cluster has the highest familiarity with meat products and, for this reason, consumers were able to evaluate the

product on the basis of intrinsic cues, appreciating sensory differences among samples. They had high expectations for new products, as a consequence of the provided information, even if lower compared with the other clusters, but the informed liking revealed the prevalence of the sensory aspect.

The cluster analysis results provide suggestions about salami consumer preferences associated with healthy meat products and prove that some sociodemographic features discriminate consumers' clusters from each other. Such discrimination could be very useful for identifying consumers' segments which should be considered when studying purchasing habits and consumers' attitudes towards meat attributes, particularly for the development of innovative products.

CONCLUSIONS

The results highlight that information about nutritional properties of salami has a marked influence on consumer expectancy but does not always impact on actual liking, thus indicating that informed liking needs to be evaluated in relation to sensory properties. Cluster analysis demonstrates that consumers are not homogeneous in accepting a product. A great expectation for low saturated fat salami is shown in the three considered segments, with different reactions to information and sensory evaluation. Subjects of the first segment, 'occasionally meat product consumers', are not able to appreciate intrinsic cues, so information plays a relevant role in forming their opinion. The second segment consists of consumers with higher experience and more

sensitive to health concerns, 'healthy food lovers'. They take care over food consumption, giving great attention to information, particularly concerning new products. Information provided by producers could deeply influence the buying decisions of this group of consumers. In the last segment, there are heavy meat consumers accustomed to meat taste, called 'cured meat lovers', who, despite their interest in information, disclose the prevalence of sensory aspects in their informed liking.

The results could provide useful indications for food policy makers, food companies and consumers. Policy makers could be interested in consumers' reactions to information about healthy novel products in their ongoing commitment to implement regulations and communication campaigns aimed at achieving healthier food choices. Companies could get useful suggestions for the development of new products, e.g. low fat salami, considering well-known high failure rates of innovative products at market introduction. The cluster analysis results suggest that the provision of information can be used as an influential marketing tool to differentiate meat products, but it should take into consideration the two most important variables: health reasons and taste preferences. Moreover, the launch of a new product with healthy characteristics could improve the image of the red meat sector. Finally, taking advantage from policy makers' and companies' activities, consumers will be allowed to choose a new product and to make better informed decisions in line with their preferences.

Since few studies have examined the influence of health information about fat content of salami and consumers' liking, further researches are encouraged, taking into account the limitations of the present paper. The analysis has considered an Italian region, so it would be interesting to extend it to the whole country or to several countries in order to compare consumers' differences. In such case, more variables for market segmentation should be considered: geographic, demographic, psychographic and behaviouristic.

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