

Health labelling can influence taste perception and use of table salt for reduced-sodium products

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Abstract

Objective: To investigate the effect of front-of-pack labels on taste perception and use of table salt for currently available and sodium-reduced soups.

Design: Within-subject design.

Setting: Sensory laboratory.

Subjects: Participants (n 50, mean age 34.8 (SD 13.6) years) were randomly served nine soups (250 ml each) across 3 d. Servings differed in: (i) health label (i.e. no health label, reduced-salt label or Heart Foundation Tick); and (ii) sodium reduction (no reduction – benchmark, 15% less sodium or 30% less sodium). Before tasting, participants rated their expected salt intensity and liking. After tasting, participants rated their perceived salt intensity and liking, after which they could add salt to the soup to make it more palatable.

Results: Reduced-salt labels generated a negative taste expectation and actual taste experience in terms of liking ($P < 0.05$) and perceived saltiness ($P < 0.05$). Perceived saltiness of sodium-reduced soups decreased more ($P < 0.05$), and consumers added more salt ($P < 0.05$), when soups carried the reduced-salt label. The tick logo and soups without health labels had no such influence on taste perception.

Conclusions: Emphasizing salt reduction by means of a front-of-pack label can have a negative effect on taste perception and salt use, especially when consumers are able to taste differences between their regular soup and the sodium-reduced soup. Overall health logos which do not emphasize the reduction in salt are less likely to affect perceived salt intensity and therefore are viable solutions to indicate the healthiness of sodium-reduced products.

Keywords
Salt
Taste
Consumer
Labelling
Soup
Expectation
Liking
Desire

Australian consumers are well informed and seem to be increasingly aware of the association between diet and health⁽¹⁾. A recent study suggests that 88% of Australian consumers are aware of the association between high sodium intake and elevated blood pressure, but a minority (44%) were worried about their sodium intake or were aware (27%) of the upper limit of daily sodium intake set by the Australian National Heart Foundation⁽²⁾, which makes it difficult for them to understand nutrition information panels which are placed on food products.

To assist consumers in making healthier food choices several initiatives are taken. First, some food products carry nutrient labels on the front of the pack, such as 'low in salt'⁽³⁾, which may attract the attention of health-conscious consumers^(3,4). In Australia nutrient claims and labels are regulated by the Australia New Zealand Food Standards Code which, for example, states that a 'low salt' label is only permitted on foods which do not contain more than 120 mg Na/100 g food⁽⁵⁾. Health claims in relation to sodium reduction are not permitted by the

Code. Second, some food products carry a front-of-pack health logo, which enables consumers to make quick and healthier food choices^(6,7). In 1989 the Australian Heart Foundation initiated the 'Pick-the-Tick' programme. A manufacturer can apply for a Tick by submitting a proposal to the Heart Foundation, which reviews the proposal according to predetermined criteria (see^(8,9)). Ten years after the introduction of the Pick-the-Tick programme, 89% of Australian consumers recognized the Tick logo and the majority (59%) reported to buy products with this logo⁽⁹⁾.

Although nutrient labels as well as health logos aim to assist consumers in making a healthier choice, they may not attract consumers who are more concerned about taste than health. It has been suggested that health-conscious consumers are more likely to buy products with healthy choice logos compared with taste-focused consumers⁽¹⁰⁾. This may generate a potential unexpected side-effect of nutrient labels and healthy choice logos. Some consumers may deliberately avoid products with nutrient labels and/or healthy choice logos, because they expect these products to

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be inferior in taste⁽⁶⁾. Information given alongside food may trigger different areas of the brain in such a way that information associated with a bad taste triggers brain areas also known to be activated by the smell of a bad odour⁽¹¹⁾.

In a study with margarines, it was found that consumers who held positive beliefs about full-fat spread judged margarines which carried a 'full fat' label as more pleasant, smoother and having better mouthfeel than identical margarines which were labelled as 'reduced fat'⁽¹²⁾. Similar results were also obtained with soups⁽¹³⁾. We previously suggested that labels such as 'reduced in salt' negatively impacted on expected saltiness, but not perceived saltiness of non-sodium-reduced soups⁽¹⁴⁾. It is yet unknown how nutrient labels and healthy choices logos affect the perception of products which are noticeably different from consumers' normal products due, for example, to sodium reduction.

Hypothetically, the discrepancy in terms of liking and perceived saltiness between consumers' normal product and the reduced-sodium product can be increased when consumers expect products to be less salty and/or tasty. This is called assimilation. During assimilation, consumers' perception is biased towards their expectations^(15,16). Lange *et al.* suggested that when differences (induced by the type of information) between blind ratings and expectations of identical orange juices were large, consumers moved their ratings towards their expectations⁽¹⁷⁾. A similar phenomenon may happen when consumers taste a variety of sodium-reduced soups while seeing different health- and nutrient-related labels, which alter consumers' expectations of the taste of the products in the direction of their expectations.

The present study investigated the influence of nutrient labels (i.e. 'Now reduced in salt, great taste') and a health logo (i.e. Pick-the-Tick) on expected and perceived taste perception of sodium-reduced soups. It is hypothesized that with an increase in sodium reduction, the negative taste effects of a nutrient label and health logo will increase as well.

Experimental methods

Participants

Participants were recruited by means of flyers in public places. Those who reported to be allergic to the ingredients present in the test products were excluded. This resulted in fifty participants (thirty-three females; mean age 34.8 (SD 13.6) years) who completed all sessions for which they received a \$AUD 15 gift voucher after each session. The study was approved by the Human Ethics Committee of Deakin University (HEAG-H 180/09).

Materials

Soups

Three soups varying in sodium content were included in the study: (i) benchmark product, which was an Australian

commercially available chicken noodle soup (305 mg Na/100 ml prepared soup); (ii) 15% sodium-reduced soup (259 mg Na/100 ml prepared soup); and (iii) 30% sodium-reduced soup (213 mg Na/100 ml prepared soup). The recipe for all soups was the same (per 100 ml prepared soup: energy 75.2 kJ, protein 0.44 g, total fat 0.24 g, saturated fat 0.04 g, carbohydrates 3.4 g, sugar 0.6 g); only the sodium content was different. All soups contained: noodles, maltodextrin, salt, sugar, flavours (containing milk derivatives), flavour enhancers (621, 627), sunflower oil, parsley, potassium chloride, turmeric and spice extract. The soups were especially produced for the purpose of the current study (Unilever Sydney, Australia).

Quantitative Descriptive Analysis was performed with seven trained panellists (six females, mean age 51 (SD 15) years) to assess sensory profiles (see Meilgaard *et al.*⁽¹⁸⁾ for more details). This resulted in seventeen attributes to describe the flavour of the soup. Individual sensory testing of the three chicken noodle soups (i.e. benchmark, -15% and -30% sodium reduction), in duplicate, commenced once panellists were able to rate the intensity of the seventeen attributes reliably within and between panellists (see Meilgaard *et al.*⁽¹⁸⁾ for more details). Figure 1 shows the sensory profile of the three chicken noodle soups.

Labels, bowls and salt shakers

Professionally produced labels (Red Gecko Design, Sydney, Australia) were placed on the different pouches of dry soups in such a way that the experimental labels had a similar layout and look to the commercially sourced soup labels. Soups (benchmark, -15% and -30% sodium reduction) were provided with one of the three different labels: (i) no health label; (ii) a nutrient label stating 'Now reduced in salt, great taste' (hereafter referred to as the 'reduced-salt label'); and (iii) a health logo, the Heart Foundation Tick (hereafter referred to as the 'tick label'; see Fig. 2). Each combination of label and soup was given once (3 labels × 3 soups), which resulted in nine samples for tasting. Soups were tasted from polystyrene double-layered bowls, which were designed to minimize the cooling down of the soups and could hold up to 350 ml of soup. Plastic spoons were provided to the participants. Furthermore, participants were provided with commercially sourced salt shakers which contained 50 g of salt (Saxa table salt shakers, 8 cm × 4 cm, nine holes). Salt shakers were weighed, on a digital scale with microgram accuracy (model X3-310D; Denver Instrument), before and after participants tasted the soup. The salt shaker provided on average 0.04 g salt per shake.

Sensory measures

Expected and perceived saltiness were measured with a 9-point just-about-right scale which combines intensity and hedonic judgements and was previously designed to assess consumers' response to a specific attribute⁽¹⁹⁾. On this scale 1 = 'not salty enough at all', 5 = 'just about

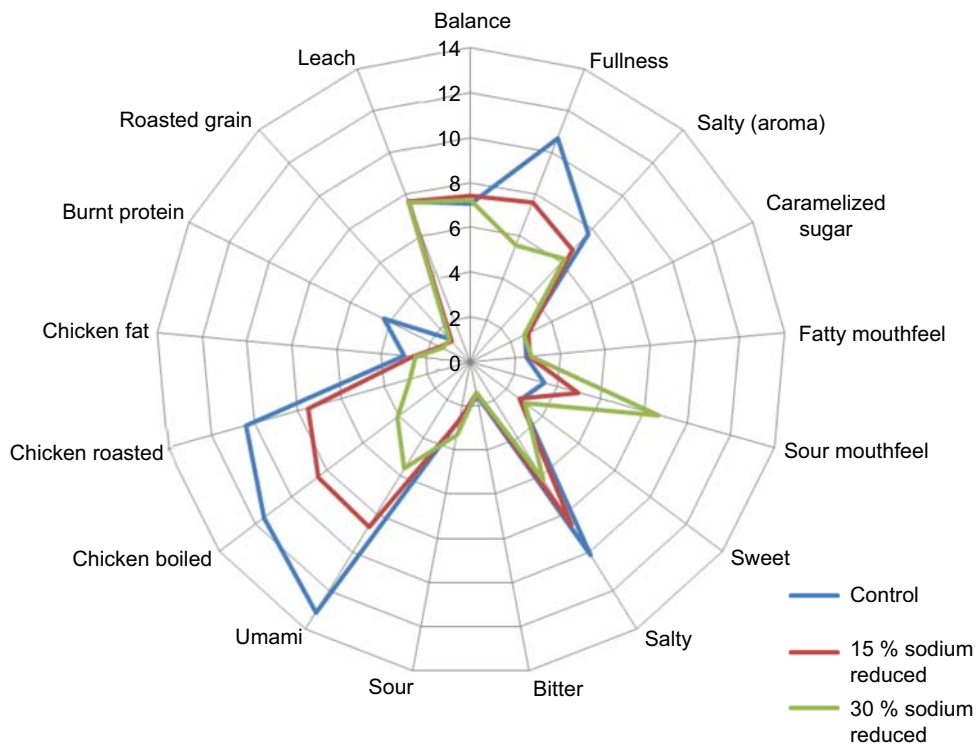


Fig. 1 (colour online) Sensory profile of the benchmark, 15% and 30% sodium-reduced soups as determined by Quantitative Descriptive Analysis among seven panellists (0 = 'not strong at all', 14 = 'extremely strong')



Fig. 2 (colour online) Packages (left, no health label; middle, reduced-salt label; right, tick label) that were shown to the participants prior to and during the tasting of the soups

the right amount of salt for me' and 9 = 'far too salty for me'. Expected and perceived liking were measured with a 9-point hedonic scale ranging from 1 = 'not liked at all' to 9 = 'extremely liked'. All sensory data were collected using CompuSense software version 5 (Compusense Inc., Guelph, ON, Canada).

Procedure

Consumers came to the university for a half-hour session on the same day and time once weekly for 3 weeks. Tasting took place in the sensory booths of the university, which minimized interaction between participants while they tasted the soups. At the start of each session participants

were shown a package of soup and were asked whether they would like to buy this soup and what they expected of the liking, desire and saltiness of this soup. Subsequently, they were instructed to open the pack and empty the content in a soup bowl. The researcher then added boiling water to a total of one serving (250 ml) of soup. Participants were instructed to taste one spoonful of the soup when it was cooled down to about 65°C, which was verified with a laser thermometer for each soup (model VZ8895NL, range -40 to 800°C; AZ Instruments). While tasting the soup, participants were asked to rate the soup on perceived liking and salt intensity. After tasting and rating the soup, participants were given a salt shaker with 50 g of salt and were instructed to add as much salt as they wanted up to their maximum liking. Participants were allowed to taste the soup while they were adding salt and were free to decide not to add any salt at all. In total, participants tasted nine soups in a randomized order during three sessions on three separate days in such way that they received one pack with no label, one pack with the reduced-salt label and one pack with the tick label each day. Every consumer received a unique order; no order was given more than once. Between sessions, participants were instructed to rinse their mouth with water three times.

Statistical analysis

To assess the strength and direction of the association between expectations and actual perception, Spearman correlation coefficients were calculated between expected liking and perceived liking and between expected salt intensity and perceived salt intensity. In order to determine differences in expected liking, one-way repeated-measures ANOVA (according to the within-subject design) were conducted to determine significant differences between (i) soups with different labels and (ii) soups with the same label given during the three testing days. A similar analysis was conducted to determine differences in perceived liking after participants tasted the soups.

We hypothesized that consumers were more likely to buy and consume a soup with an ideal saltiness than a soup with a less ideal saltiness, so therefore it was important to assess whether soups were perceived as significantly different from their ideal saltiness. In order to determine whether the expected and perceived salt intensity significantly differed from the 'just about right' value of 5, one-sample *t* tests were conducted with 5 as the set value.

For those who added salt after tasting the soups, a sodium compensation score was calculated by adding the amount of sodium consumers added to the amount of sodium present in the soup; this resulted in the total amount of sodium. The total amount of sodium was then expressed as a percentage of the total amount of sodium present in the benchmark minus 100. For example, if a participant added 250 mg of NaCl to 250 ml of the -15% sodium-reduced soup, the amount of sodium added = $0.25 \times 39.3 = 98 \text{ mg Na}/250 \text{ ml soup}$. This amount was

added to that in 250 ml of -15% sodium-reduced soup, which contained 648.1 mg Na/250 ml soup. Thus the total amount of sodium = $648.1 \text{ mg} + 98 \text{ mg} = 746.1 \text{ mg Na}/250 \text{ ml soup}$. The benchmark soup contained 762.5 mg Na/250 ml soup. The compensation percentage = $[(746.1/762.5) \times 100\%] - 100 = -3\%$. This means that after this participant added salt to the -15% reduced-sodium soup, the soup contained 3% less sodium than the benchmark soup.

Friedman analyses (according to the within-subject design) for ranks and *post hoc* comparisons were conducted to determine if there were significant differences between the amounts of salt participants added after tasting soups with (i) different labels and (ii) different levels of sodium reduction. Statistics were performed with the statistical software package PASW Statistics version 18 (IBM, Armonk, NY, USA).

Results

Participants

The majority of participants were below the age of 40 years and well educated. More than half of the participants stated that health labels influenced their purchase decision (see Table 1).

Expected liking and salt intensity

Expected liking

All soups were expected to be liked, with scores between 4.4 and 5.3 on a 9-point hedonic scale. Participants tended to expect the soups with the reduced-salt label to be less liked than the same soups without labels ($0.05 < P < 0.10$). No statistically significant differences were observed between the different soups with the same

Table 1 Characteristics of the study participants

Characteristic/category	Mean	SD
Age (years)		
Females (<i>n</i> 33)	35.8	14.5
Males (<i>n</i> 17)	34.4	13.3
	<i>n</i>	% of total
Education level		
Secondary education or below	7	14
Tertiary education	19	38
Postgraduate or higher	24	48
Check the nutrition information when shopping		
Always	14	28
Often	21	42
Sometimes	4	8
Rarely	0	0
Never	11	22
Labeling affects my food purchase		
Always	11	22
Often	20	40
Sometimes	2	4
Rarely	1	2
Never	16	32

Table 2 Mean expected and perceived liking and salt intensity for the benchmark, 15% and 30% sodium-reduced soups with the three different labels

	Expected liking before tasting						Perceived liking after tasting					
	Benchmark		15% sodium reduced		30% sodium reduced		Benchmark		15% sodium reduced		30% sodium reduced	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
No label	4.9 ^a	1.6	5.1 ^a	1.5	5.3 ^a	1.5	4.5 ^a	1.6	4.4 ^a	1.4	4.0 ^a	1.2
Tick label	4.8 ^{a,b}	1.3	4.8 ^a	1.4	5.2 ^a	1.2	4.7 ^a	1.1	4.3 ^a	1.6	4.0 ^a	1.2
Reduced-salt label	4.4 ^b	1.5	4.5 ^{b*}	1.3	4.8 ^{b*}	1.4	3.9 ^b	1.4	5.5 ^b	1.6	3.8 ^a	1.2
	Expected salt intensity before tasting (on JRS)						Perceived salt intensity after tasting (on JRS)					
	Benchmark		15% sodium reduced		30% sodium reduced		Benchmark		15% sodium reduced		30% sodium reduced	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
No label	6.2†	1.4	6.3†	1	6.3†	1.4	6.8†	1.1	4.9	1.0	4.1†	1.0
Tick label	4.3†	1.2	4.3†	1.1	4.4†	1.2	6.2†	1.5	4.8	1.4	3.6†	1.1
Reduced-salt label	3.6†	1.2	3.6†	1.1	3.7†	1.1	5.5†	1.5	4.2†	1.3	3.4†	1.2

Liking was measured with a 9-point hedonic scale: 1 = 'not liked at all' to 9 = 'extremely liked'.

Salt intensity was measured with a just-about-right scale (JRS): 1 = 'not salty enough at all', 5 = 'just about the right amount of salt for me', 9 = 'far too salty for me'.

^{a,b}Mean values within columns with unlike superscript letters were significantly different, as measured with a repeated-measures ANOVA ($P < 0.05$).

*Reduced-salt label soups tended to be different from soups without a label ($P < 0.10$).

†Significantly different from the just-about-right salt intensity which was set at 5, as measured with a one-sample *t* test ($P < 0.05$).

label in terms of expected liking across the 3 d of testing (see Table 2). Participants were more willing to buy the soups with the tick label (mean 5.4 (SD 1.6)) than the benchmark soups without such label (mean 4.2 (SD 1.4); $P < 0.01$).

Expected salt intensity

Participants expected the soups without health labels to be significantly above their ideal saltiness (mean range 6.2 to 6.3, i.e. too salty), whereas soups with health labels were expected to be significantly below their ideal saltiness (mean range 3.6 to 4.4, i.e. not salty enough; all $P < 0.05$). No significant differences in expected salt intensity were observed between the responses to the same packages on the three different days (see Table 2).

Perceived liking and salt intensity

Perceived liking

When participants actually tasted the soups a strong positive association between expected liking and perceived liking was observed for all soups across all labels (all r between 0.44 and 0.86; all $P < 0.001$). Benchmark soups were medium liked (mean range 3.9 to 4.7) and significantly influenced by labels. That is, benchmark soups with the reduced-salt label were less liked (mean 3.9 (SD 1.4)) than similar soups with no label (mean 4.5 (SD 1.6); $P < 0.05$) or the tick label (mean 4.7 (SD 1.1); $P < 0.01$). Soups which were 15% reduced in sodium and carried the reduced-salt label were more liked (mean 5.5 (SD 1.6)) than similar soups with no label (mean 4.4 (SD 1.4); $P < 0.01$) or the tick label (mean 4.3 (SD 1.6); $P < 0.01$). Labels did not significantly influence participants' liking for soups which were 30% reduced in sodium. The

soups which were 30% reduced in sodium and carried either the tick label ($P < 0.01$) or no health label ($P < 0.01$) were less liked than the benchmark soups with these labels. No such difference was observed for soups which carried the reduced-salt label (see Table 2).

Perceived salt intensity

All benchmark soups were perceived as significantly above participants' ideal salt concentration (mean range 5.5 to 6.8; $P < 0.05$). The benchmark soup with the reduced-salt label was perceived as significantly closer to participants' ideal salt intensity (mean 5.5 (SD 1.5)) than soups with either the tick label (mean 6.2 (SD 1.5); $P < 0.05$) or no health label (mean 6.8 (SD 1.1); $P < 0.01$). The benchmark soup with the tick label was perceived as significantly closer to participants' ideal salt concentration than the same soup without a health label ($P < 0.05$). Participants' expectations concerning salt intensity of the benchmark was significantly positively associated with their perceived salt intensity when the package did not carry the reduced-salt label (no label $r = 0.50$, $P < 0.01$; tick label $r = 0.32$, $P < 0.05$; reduced-salt label $r = 0.14$, $P = 0.33$; see also Table 2).

When consumers tasted the 15% sodium-reduced soups, the soup with the reduced-salt label was perceived as significantly below participants' ideal salt concentration (mean 4.2 (SD 1.3); $P < 0.001$), whereas the 15% sodium-reduced soup with the tick label (mean 4.8 (SD 1.4)) and that without a health label (mean 4.9 (SD 1.0)) were not perceived as significantly different from consumers' ideal salt concentration. Expected and perceived salt intensity of the 15% sodium-reduced soup were significantly positively associated when the package carried either the tick or the reduced-salt label (no label $r = 0.06$,

$P=0.66$; tick label $r=0.39$, $P<0.01$; reduced-salt label $r=0.33$, $P<0.05$).

All 30% reduced-sodium soups were perceived as below consumers' ideal salt concentration (mean range

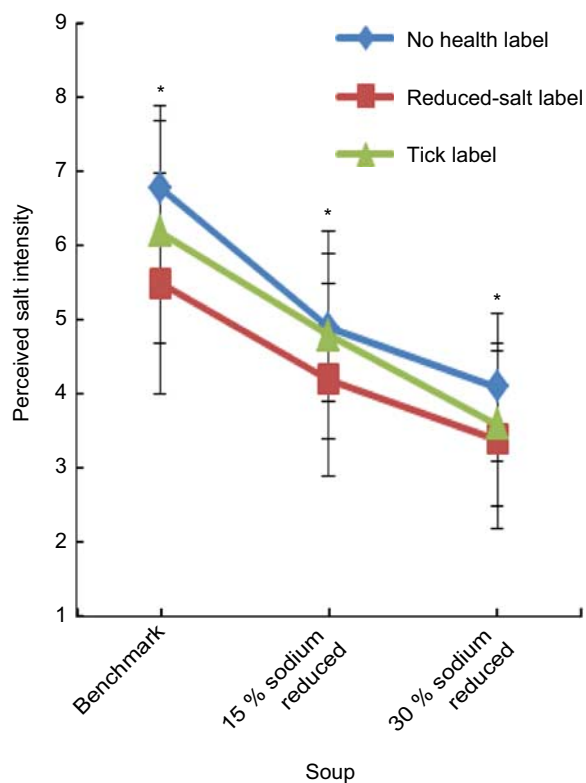


Fig. 3 (colour online) Participants' perceived salt intensity (1 = 'not salty enough at all', 5 = 'just about the right amount of salt for me', 9 = 'far too salty for me') for benchmark, 15% and 30% sodium-reduced soups with the three different labels (no health label, reduced-salt label and tick label). Values are means with their standard deviations represented by vertical bars. *Mean value was significantly different between soups with the same sodium content: $P<0.05$

3.4 to 4.1; $P<0.001$). The soup with the reduced-salt label was, however, perceived as significantly further from consumers' ideal salt intensity (mean 3.4 (sd 1.2)) than the soups with either the tick label (mean 3.6 (sd 1.1); $P<0.01$) or no health label (mean 4.1 (sd 1.0); $P<0.01$; see Fig. 3). Overall, perceived salt intensity decreased with decreasing sodium concentration (all $P<0.001$). Expected and perceived salt intensity were strongly associated when the package carried the reduced-salt label, but not when other labels were present (no label $r=0.28$, $P=0.05$; tick label $r=0.21$, $P<0.15$; reduced-salt label $r=0.66$, $P<0.001$).

Adding salt

The number of participants who added salt after tasting increased as the sodium reduction became larger (see Table 3). In addition, those who added salt to their soup generally added more salt when soups were further reduced in sodium. For every soup (i.e. benchmark, 15% reduced in sodium, 30% reduced in sodium), a greater number of participants added salt when the soup carried the reduced-salt label than when the same soup carried either the tick label or no health label. Those who added salt also added more salt when soups carried the reduced-salt label ($P<0.05$). When sodium was reduced by 30% and accompanied by the reduced-salt label participants over-compensated the reduction in salt; this resulted in 8% higher salt consumption than when they consumed the benchmark soup (see Table 3).

Discussion

The present study suggests that when consumers are able to taste the sodium reduction, a nutrient label which states 'now reduced in salt, great taste' magnifies the perceived difference in terms of ideal saltiness, and consumers add more salt.

Table 3 Average amount of salt added and number of participants who added salt to the benchmark, 15% and 30% sodium-reduced soups with the three different labels

	n*	Salt added (g)†		% Na added relative to benchmark‡		Significance of difference§
		Mean	SD	Mean	SD	
Benchmark						
No label	2	0.03	0.01	1.5	0.7	
Tick label	2	0.47	0.24	24.0	12.3	
Reduced-salt label	8	0.23	0.25	11.6	12.8	
15% sodium reduced						
No label	14	0.25	0.26	-2.0	13.6	$P<0.05$
Tick label	15	0.37	0.40	4.1	20.6	
Reduced-salt label	28	0.36	0.19	3.5	9.8	
30% sodium reduced						
No label	30	0.58	0.36	-0.3	18.3	$P<0.01$
Tick label	35	0.57	0.27	-0.8	13.9	
Reduced-salt label	46	0.75	0.32	8.3	16.6	

*Number of participants who added salt out of 50.
 †Amount of salt added to 250 ml soup, calculated for those who did add salt.
 ‡Calculated as $\{[(Na\ added + Na\ in\ soup) / Na\ in\ benchmark] \times 100\} - 100$.
 §Significant difference between the labels as measured with a Friedman analysis for ranks.
 ||No statistics were applied due to the low n.

The effect of the reduced-salt label on perceived liking is less clear. Potentially the negative expectation, generated by the reduced-salt label, may have created a pleasant surprise when consumers tasted the sodium-reduced soup (i.e. 'It's not as bad as I thought it would be'). This contrast effect did not seem to take place when soups were further reduced in sodium, which elicited a clear perceivable difference with the benchmark, nor was the contrast effect evident when consumers were asked to rate ideal saltiness or when they were asked to add salt to optimize pleasantness of the soup. This may suggest that overall liking is influenced by more aspects than just saltiness.

Consumers can make a variety of foods more palatable by adding precise amounts of table salt^(20–23). Previous studies in which participants added salt to sodium-reduced meals suggested that consumers compensated only between 20% and 22% of the sodium which was left out of the meal^(24,25). This resulted in a meal with a lower salt concentration than the original non-sodium-reduced meal. In our study, consumers added larger amounts of salt to the sodium-reduced soups, which resulted in soups which contained about the same or higher amounts of salt than the non-sodium-reduced soup. However, these previous studies were conducted with whole meals where salt is more likely to be on the surface after it has been added from a salt shaker. This is in contrast with the present study where salt was added to a liquid (soup). It has previously been suggested that salt on the surface of the food will elicit a higher salt intensity than salt dissolved in food⁽²⁶⁾.

It is important to note that only 28% of the participants added salt to the 15% sodium-reduced soups even though no additional flavour-enhancing ingredients were added by the manufacturer to compensate for the sodium reduction. This means that, when sodium reduction is compensated by other ingredients, a reduction of 15% in soups might be feasible as long as consumers are not being made aware of the sodium reduction. Currently, Unilever soups in Australia are in general 26% lower in sodium than similar soups in the USA and 7% lower in sodium than in the UK. This suggests that soups in for example the USA could be lowered further in sodium, preferably in small incremental steps, so that the salt reduction is not perceived and consumer acceptance will be maintained.

The present study was carried out in a laboratory setting in which the information provided on the front of the pack had little competition from other stimuli which may attract consumers' attention in a real shopping and eating environment. Furthermore, our study sample consisted of consumers below the age of 40 years. These consumers might be more focused on taste and less focused on health than older consumers, because older aged consumers are more likely to have been in contact with a variety of chronic diseases⁽²⁷⁾ and are more likely

to check nutrient information while shopping⁽²⁾. It would therefore be worthwhile to repeat the present study with older consumers. Furthermore, our sample was in general highly educated, which could have increased the number of health-conscious consumers⁽²⁸⁾.

To our knowledge, research suggesting that front-of-pack labelling influences food choice has generally been performed in markets in which a particular front-of-pack label has recently been introduced. Consumers may pay attention to these labels because they have been exposed to heavy marketing around the logo⁽²⁹⁾. Longitudinal studies in which the effectiveness of front-of-pack health logos is investigated over time are lacking to our knowledge. It could well be that, after a while, a front-of-pack logo loses the attention of consumers. Attention is driven by consumers' motivation, which is in line with their driver of purchase⁽²⁹⁾. Future studies need to focus on the influence of front-of-pack health logos, such as the Heart Foundation Tick, on taste perception and liking in an in-home setting, not only initially, but also after repeated consumption over a longer time frame. Furthermore, it is recommended to assess the effectiveness of health labels on long-term food purchase and consumption in markets where these labels are no longer supported by marketing.

Conclusions

A label that explicitly notifies consumers of a reduction in sodium decreases the expected and perceived salt intensity, and may increase the use of table salt, especially when products are perceivably different in salt intensity. Overall health logos which do not emphasize the reduction in salt are less likely to affect perceived salt intensity and therefore are a viable solution to indicate the healthiness of sodium-reduced products. This is a relatively new area of research, but already it is beginning to deepen our understanding of how best to design and market healthy choices.

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