



Health claim effects on consumer acceptability, emotional responses, and purchase intent of protein bars

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ABSTRACT

Consumers are seeking product's claims to make their daily food purchase decisions more informed. In this context, health claims can communicate to consumers about nutrient-specific health benefits. The objective of this research was to study the effect of health claims, in textual form, on consumers' acceptability, emotional responses, and purchase decisions regarding protein bars. For this study, four protein bars were selected by a focus group ($N = 6$) based on acceptability. A total of $N = 80$ participants evaluated the pre-selected protein bars in two different tasting sessions [(1) Blind, where no information was provided, and (2) Informed, where health-related information of protein bars was provided]. Participants rated their liking for different sensory attributes (appearance, aroma, taste, texture, sweetness, bitterness, and aftertaste) and overall liking using a 9-point hedonic scale. Check-all-that-apply (CATA) was used to study emotions and 22 terms related to sensory attributes of the protein bar. There was a non-significant increase in the purchase intent for three out of four samples in session 2 but it was found to be high for the sample associated with positive emotions. Overall, this study showed that taste overpowered the health claims (expressed in textual form) on the acceptability. There were, however, slight effects of the health claims on the elicited emotions of consumers towards the protein bars.

1. Introduction

The chaotic and sometimes orderly lifestyle of urban consumers demands what Sharma et al. [1] termed a hurried or light meal, often known by the term "snack" by others, in between those formal full-course meals. Snack foods have been defined previously as any food item that is small, convenient, ready to eat, eaten between meals, easily available, and eaten anywhere [2,3]. As snack foods have become an indistinguishable part of modern lifestyle, they are increasingly used as a platform, in some cases indeed as a meal replacement, to effectively deliver targeted nutrition to its intended users [1]. Among snack foods, protein bars are of particular interest to youth for their sports nutrition benefits, healthiness [4], and endurance capacities. Hence, protein bars have received a lot of interest in muscle building, running, hiking, and other recreational activities. For the same and other business-related reasons, bar manufacturers often use a variety of health claims to help the buyer make informed decisions as well as to have an edge over competitors.

Health claims may have a 'halo' effect [5], as previously shown that claims may elicit positive or negative biases [6] in terms of purchase

intent, amount of consumption, product perception [7], sensory properties [8], and acceptance [9]. Health claims may use as a mental shortcut, a so-called heuristic, to make a judgment of the healthfulness of a product. Age, gender, education, and flavour have been identified previously to influence information processing among consumers. Females have been found to have higher levels of nutrition knowledge than men [7], and unsurprisingly, a biased relationship was reported recently concerning healthy food purchasing decisions [4]. Generally, claims are used as arguments for describing the product's uniqueness, and the highest impact of these types of claims has been observed on the "experience" attributes, such as satiation and taste (B. [10]. For instance, chocolate-flavored protein bars were liked over vanilla, strawberry, and hazelnut flavors [4]. This study aimed to investigate the effect of positive claims, expressed in textual form, on sensory properties, including emotions, and consumer acceptability.

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Table 1

Analysis of variance of the effect of conditions, samples and their interaction on sensory attributes and overall liking of the protein bars.

Effects	Sensory liking							
	Appearance		Aroma		Taste or Flavour		Sweetness	
	F-value	P-value	F-value	P-value	F-value	P-value	F-value	P-value
Conditions	0.47	0.49	1.24	0.26	0.35	0.55	1.20	0.27
Samples	1.89	0.13	4.31	0.00	6.07	0.00	4.08	0.00
Condition × Sample	0.19	0.90	0.43	0.73	0.27	0.87	0.52	0.67
Effects	Bitterness		Texture		Aftertaste		Overall liking	
	F-value	P-value	F-value	P-value	F-value	P-value	F-value	P-value
	Conditions	0.08	0.77	0.91	0.34	0.91	0.34	0.89
Samples	4.16	0.00	12.69	0.00	4.28	0.00	6.22	0.00
Condition × Sample	0.10	0.96	0.38	0.76	0.16	0.92	0.54	0.65

F: F-value, mean square/mean square error; P: p value, treatment effects are considered as significant if the $p \leq 0.05$ (significant results were italicized and bolded).

2. Material and methods

2.1. Selection of samples

Initially, ten protein bars of different flavors and brands (Count-down™, Lincoln, New Zealand) were tested for liking by using a focus group of six panelists (N = 6). Based on their initial liking, two samples, namely, coconut + goji berry with dark chocolate (CGB) and cranberry + raspberry (CR) were liked the most, while two samples, salted caramel (SC) and coconut and dark chocolate with freeze-dried raspberries (CDC) were disliked the most. All four samples were of the same brand i. e. Nice and Natural™ which is an Aotearoa New Zealand-based company, headquartered in Auckland. The sample (8 g) was provided to participants in a transparent plastic cup labelled with a 3-digit random code for identification. The study included two sessions where the first session had no health claim information available, while the second session included health claim information. Water and unsalted crackers were provided for palate cleansing.

2.2. Participant's recruitment

A total of 80 participants (N = 80) were recruited, which includes Lincoln University students and employees. All the participants were asked to provide consent to their participation following the human ethics compliance (Application No: 2019–68). Participants also filled the form with general information about name, age, gender, and how often they eat protein bars. Participants were screened on the basis that they were at least occasionally consumers of snack bars. Out of 80 participants, 32 were males and 48 were females. The age distribution of participants ranged between 20 and 59 years, out of which 77.5% of participants were less than 35 years of age. About 63% of participants reported consuming snack bars frequently. The test took place in sensory booths under a controlled environment with room temperature 21 °C and fluorescent lights. A list of ingredients in the samples was also provided to the participants to ensure that they are not allergic to any of the ingredients involved in the protein bars used.

2.3. Testing

Both blind and informed sessions included tasting of four protein bars each. The health-claim information, as shown below, was provided to the participants in the informed session.

The samples presented in front of you are protein bars with the following health claims:

- 20–25% protein per bar: Protein increases muscle mass and strength, provides energy, increases metabolism etc.
- Contains 4 g of sugar only: Less intake of sugar
- Good source of fibre- Good for health

- Contains super-seeds like pumpkin seeds, sunflower seeds: These seeds are good for the **heart**, proved to reduce the risk of certain cancers. Pumpkin seeds are high in **anti-oxidants** and also improves prostate and bladder health. Sunflower seeds have **anti-inflammatory properties**, help to manage cholesterol, Rich in B-complex vitamin that is good for healthy **nervous system**
- No artificial colour and flavours used

The health claim information was obtained from the package of commercial protein bars and refined further to increase the understanding of the made claim. Participants were asked to taste the sample and report their liking or disliking on a 9-point hedonic scale for appearance, aroma, flavor, sweetness, bitterness, texture aftertaste, and overall liking. A total of 20 emotion terms (“happy”, “healthy”, “calm”, “pleasant”, “satisfied”, “good”, “enjoyable”, “active”, “interested”, “nurturing”, “guilty”, “regret”, “sad”, “worried”, “disgusted”, “neutral”, “bored”, “hate”, “unpleasant” and “comforting”) were listed to be selected by the participants during the test using the Check-all-that-apply (CATA) methodology. This list of emotional terms was selected from 48 original words gathered from the EsSense Profile® and previous studies [11]. The participants also evaluated 15 taste/flavour terms (sweet, salty, bland, sour, bitter, dry, umami, creamy, nutty, chocolatey, dairy, fruity, caramel, roasted and off-flavour) and seven texture terms (soft, chewy, smooth, brittle, grainy, hard and sticky) related to the protein bar [12] using CATA. For purchase intention, a binomial scale (Yes or No) was used to answer the question “Will you buy the protein bar in the future?”. Responses of the participants were recorded using the RedJade (RedJade®, Sensory Solutions, LLC, California, USA) software.

2.4. Statistical analysis

A two-way analysis of variance (ANOVA) was used to find the significant differences between the factors, namely, samples and health-claim information. For the consumers' liking, the mean and standard error of the pooled data were calculated. For the multiple grouping within the sample and concerning the condition, the Tukey test was performed. Moreover, results from the CATA questions (attributes and emotions) and the purchase intent were evaluated using the Cochran's Q test (Sheskin test). The Principal Component Analysis (PCA) was performed to map samples on 2-dimensional space. The PCA sample attribute for blind and informed condition plot was constructed based on the mean values of the sensory attributes. Hierarchical cluster analysis was conducted on the mean values of the liking attribute to seek possible groupings of the treatments. Also, correspondence analysis was used to evaluate the frequency data of attributes and emotions. Data analysis was conducted on two software packages: for the two-way ANOVA, Minitab 19 (28002@V-Lic2, Minitab, LLC, USA) was used, and for the rest, XLSTAT statistical software (2019.4.2, Addinsoft, New York, U.S.A)

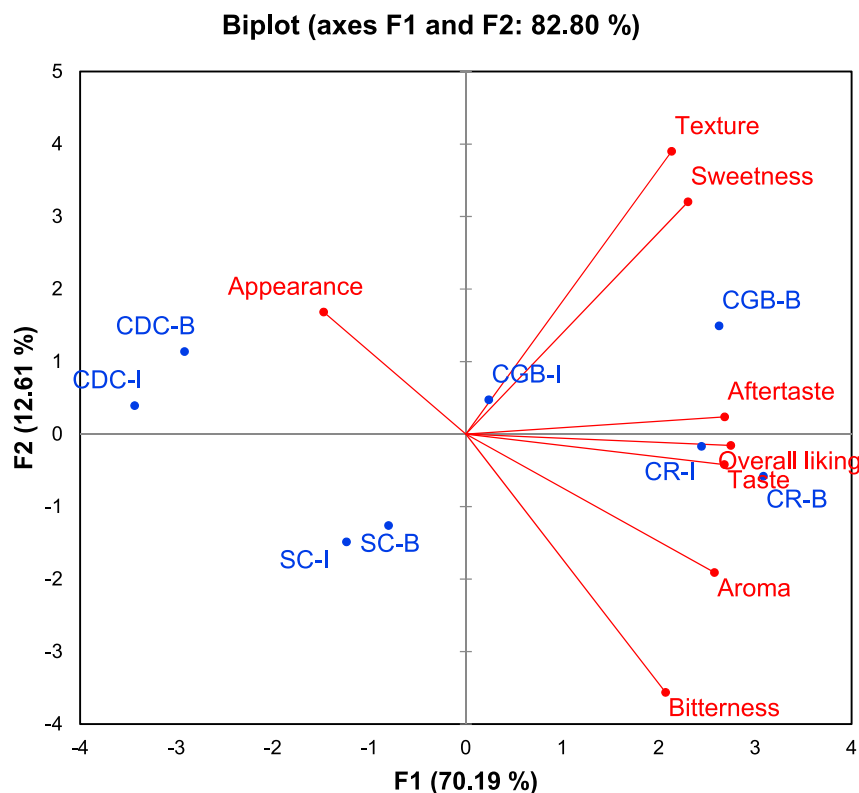


Fig. 1. Principal Component Analysis (PCA) of sensory attributes and overall liking of the protein bars in the blind and informed session. CGB = coconut + goji berry with dark chocolate; CDC = coconut and dark chocolate with freeze-dried raspberries; CR = cranberry + raspberry; SC = salted caramel. B = blind condition session; I = informed condition session.

was used.

3. Results and discussion

3.1. Sensory

No interaction was found significant, which means that health claims in association with different protein bar samples have no effect on the sensory properties measured on a 9-point hedonic scale (Table 1). The effect “participants” was added as a random effect in the general linear model. For the response “overall liking”, the effect “participants” was significant (F-value 4.43; $p \leq 0.05$; DF = 79). This is not surprising as this type of snack product tend to be polarizing in large cohorts of the population. Simultaneously, among main effects, ‘conditions’ were found to have no significant effect, which means that informing consumers about health claims was not affecting their sensory response measures. However, samples, as the main effect, were reported to have statistically significant differences ($p \leq 0.05$) among themselves. For instance, there were significant differences between the samples concerning – aroma, taste or flavor, sweetness, bitterness, texture, aftertaste, and overall liking. The significant difference among the samples with respect to different sensory attributes could be due to the difference in the ingredients used to make the different protein bars. According to Hewson et al. (2008), the interaction between sugar and fruity aromas/flavors takes place in the form of potentiation, which means that the cranberry, raspberry, goji berry, strawberry flavors augment in the presence of optimum levels of sugar, which is liked by consumers. Also, fruity flavors tend to mask other flavors like cocoa to some extent, and, in the absence of such flavors, food tends to taste more bitter. Sugar content is inversely proportional to the bitterness; i.e., less the sugar more the bitterness in the chocolate. Therefore, samples CDC and SC

(without the aromatic ingredients like cranberry, raspberry and goji berry) have less acceptability among consumers. The synergistic effect of sweet and sour together is liked by the consumers [13], and this effect has been observed in the present study as well, in the case of CGB and CR samples. Also, the presence of soy in the protein bars, if not masked by other flavors, may give a bitter aftertaste and can hinder the acceptance of products, as seen in the case of SC and CDC samples [14].

As mentioned, health claims did not have a significant effect on the acceptability of protein bars, and this phenomenon could be explained due to several factors. One reason could be the textual form of health claims provided to consumers, which was without any kind of color combinations, fonts differences, or images. Consumers might have not paid attention to the information that was presented, even when they were forced to read it. Simultaneously, the use of complicated and scientific words in health claim information leads to confusion among consumers, which could reduce the interest that ultimately deteriorates the credibility of claims [15]; Brian [16,17]. Another reason could be the age, in the present study, 77.5% of participants were less than 35 years of age. It has been proved that mature people, i.e., aged 35 or more, are more interested in health-related information and are more likely to prefer food products based on health claims as compared to the younger age groups [18]. Among other reasons, familiarity [19] or high intra-population variance [20] with any sort of information related to the food items could also influence the consumer decision-making. In the case of the informed sessions, fewer participants tasted sweetness than the blind sessions for the CR sample that could be due to the prior belief that healthy food products have less sugar; hence, familiarity plays a crucial role when tasting foods [21].

Along the lines of the previous findings, the Principal Component Analysis (PCA) revealed similar results (Fig. 1). Mostly, no notable differences were observed with the informed tasting, as both blind and

Table 2

Frequency (%) of sensory attributes perceived by the participants from protein bars in the blind and informed sessions.

Sensory Attributes	CGB		CDC		CR		SC	
	Blind	Informed	Blind	Informed	Blind	Informed	Blind	Informed
Sweet	55.0b	55.0b	37.5ab	36.3ab	57.5b	52.5b	18.8a	18.8a
Salty	13.8a	11.3a	17.5ab	17.5ab	11.3a	12.5a	37.5c	32.5bc
Bland	7.5ab	6.3ab	8.8ab	11.3ab	8.8ab	1.3a	16.3b	6.3ab
Sour	7.5a	11.3ab	10.0ab	6.3a	25.0c	21.3bc	1.3a	1.3a
Bitter	13.8ab	13.8ab	33.8c	21.3bc	8.8ab	12.5ab	2.5a	12.5ab
Dry	11.3ab	7.5ab	22.5ab	21.3ab	8.8ab	6.3a	23.8b	22.5ab
Umami	3.8a	2.5a	5.0a	2.5a	2.5a	0.0a	3.8a	7.5a
Creamy	12.5a	12.5a	1.3a	3.8a	7.5a	7.5a	7.5a	2.5a
Soft	43.8b	42.5b	7.5a	7.5a	45.0b	62.5b	5.0a	1.3a
Chewy	56.3c	56.3c	32.5ab	42.5abc	53.8bc	58.8c	27.5a	33.8ab
Smooth	16.3bc	17.5bc	6.3abab	6.3 ab	18.8bc	26.3c	0.0a	1.3a
Brittle	13.8a	7.5a	33.8b	36.3b	3.8a	8.8a	37.5b	35.0b
Grainy	48.8a	50.0a	51.3a	38.8a	48.8a	46.3a	42.5a	43.8a
Hard	7.5a	3.8a	31.3b	43.8bc	1.3a	3.8a	65cd	73.8d
Sticky	31.3ab	38.8b	18.8a	12.5a	42.5b	40.0b	16.3a	15.0a
Off Flavour	10.0a	6.3a	13.8a	15.0a	7.5a	7.5a	10.0a	10.0a
Chocolaty Flavour	41.3b	43.8b	45.0b	46.3b	2.5a	5.0a	2.5a	3.8a
Dairy Flavour	13.8b	11.3ab	10.0ab	5.0ab	6.3ab	3.8ab	1.3a	6.3ab
Fruity Flavour	50.0cd	52.5de	23.8ab	31.3bc	73.8e	71.3de	3.8a	3.8a
Roasted Flavour	26.3ab	31.3abc	46.3bcd	48.8cd	23.8a	22.5a	60.0d	56.3d
Caramel Flavour	5.0a	5.0a	17.5ab	15.0ab	7.5a	5.0a	18.8ab	23.8b
Nutty Flavour	62.5abc	51.3ab	71.3bc	67.5abc	51.3ab	50.0a	73.8c	71.3bc

Frequencies (%) with different letters in each row indicate significant differences ($p \leq 0.05$). CGB = coconut + goji berry with dark chocolate; CDC = coconut and dark chocolate with freeze-dried raspberries; CR = cranberry + raspberry; SC = salted caramel.

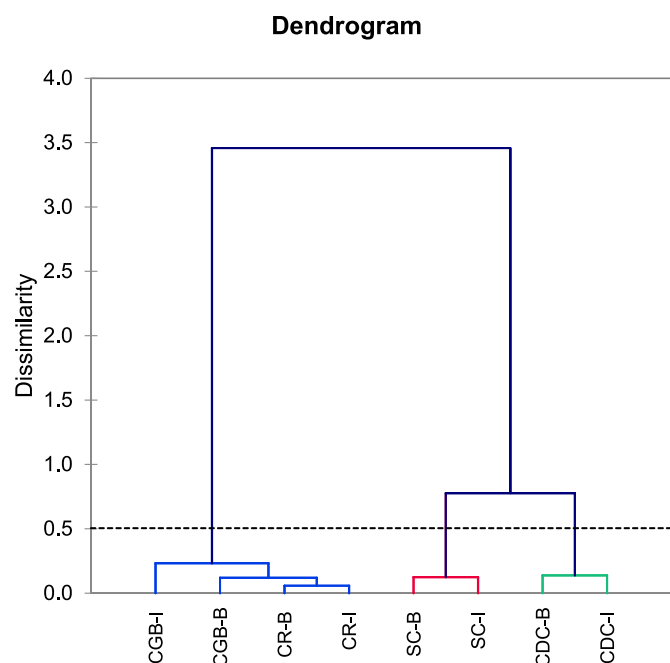


Fig. 2. Dendrogram of agglomerative hierarchical clustering (AHC) grouping sensory liking of consumers for four protein bars in the blind and informed session. CGB = coconut + goji berry with dark chocolate; CDC = coconut and dark chocolate with freeze-dried raspberries; CR = cranberry + raspberry; SC = salted caramel. B = blind condition session; I = informed condition session.

informed tastes were not poled apart. However, the PCA revealed that samples CGB and CR in the blind condition were liked more compared to CDC. This can be due to that sample CDC was considered to be drier and less chewy compared to the other samples (Table 2). Also, the synergistic effect of sweet and sour taste might have affected the acceptability of CGB and CR [13]. CDC and SC were different from CGB and CR considering all the attributes together, but also these samples belong to two different spaces on their own. This can be confirmed with the cluster analysis, where both CDC and SC represented two separate clusters

(Fig. 2). Similar results were reported from correspondence analysis (CA), where samples in both blind and informed sessions are located into very close positions (Fig. 3). Moreover, CA plots showed the associations between the sensory attributes and the samples tested in this study [22]. The cranberry-raspberry sample (CR) was found to have high correspondence with “soft”, “sour”, “creamy”, “sticky”, and “fruity flavor”. On the other hand, the salted caramel sample (SC) was found to have high correspondence with “salty”, “hard”, “roasted flavor”, and “caramel flavor”. The coconut-goji berry (CGB) sample was perceived to have “sweet”, “dairy-chocolaty flavor”, while the coconut and dark chocolate with freeze-dried raspberries (CDC) was perceived to have more “off-flavor”. The closeness of “off-flavor” to “umami” and “bitter” terms indicate that all these terms had similar row or column profiles meaning that they are related.

3.2. Emotions

The calculated frequency of emotions perceived by the participants for four different samples before and after the information provided has been summarized in Table 3. There was no significant difference between the emotions experienced by the participants considering the condition of health claim information provided or not provided. Similar results have been shown by a study conducted in the past [23], illustrating very little or no effect of health-related information on the consumer’s emotions. The participants felt “happy” when the health claim information was provided about the samples, except for CGB. The feeling of healthiness was experienced by 42.5% of participants concerning CR in the informed condition. A non-significant effect ($p > 0.05$) was observed for the emotion terms “active” and “sad” in the informed session. These findings might be partially explained due to the polarizing effect of information on consumers, which can be a cause for not finding a significant trend in the results.

In general, most samples in the blind condition, except coconut-goji berry (CGB), evoked similar emotions, such as “neutral”, “bored”, “hate”, “nurturing”, “calm”, “satisfied”, or “comforting”, while most samples in the informed condition evoked “regret”, “worried”, “good”, “happy”, or “healthy” emotions (Fig. 4). Samples CR-I and CGB-B were associated with the emotional terms “happy”, “pleasant”, “active”, “healthy”. On the other hand, CR-B and CGB-I were related to the

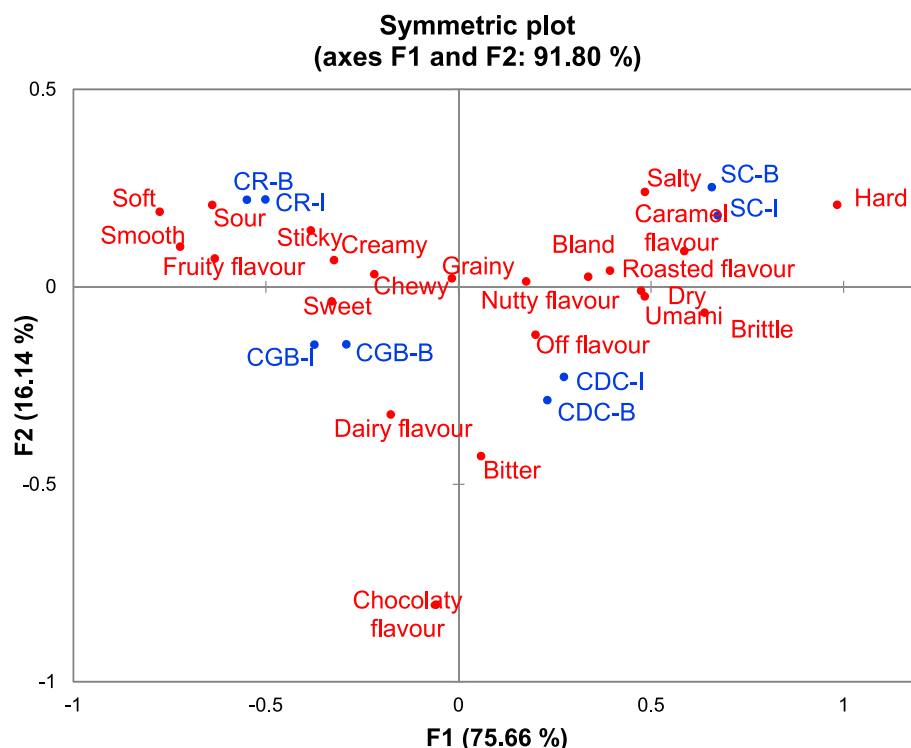


Fig. 3. Correspondence analysis of sensory attributes for the protein bars in the blind and informed session. CGB = coconut + goji berry with dark chocolate; CDC = coconut and dark chocolate with freeze-dried raspberries; CR = cranberry + raspberry; SC = salted caramel. B = blind condition session; I = informed condition session.

Table 3
Frequency (%) of participants experiencing emotions from protein bars in the blind and informed sessions.

Emotions	CGB		CDC		CR		SC	
	Blind	Informed	Blind	Informed	Blind	Informed	Blind	Informed
Happy	26.3ab	21.3ab	11.3a	18.8ab	27.5ab	33.8b	13.8a	20.0ab
Healthy	37.5ab	38.8ab	28.8ab	28.8ab	33.8ab	42.5b	23.8a	40.0ab
Calm	15a	20.0a	13.8a	8.8a	17.5a	16.3a	15.0a	18.8a
Pleasant	33.8b	31.3ab	13.8a	20.0ab	35.0b	32.5ab	18.8ab	22.5ab
Satisfied	27.5a	27.5a	21.3a	18.8a	26.3a	26.3a	26.3a	21.3a
Good	47.5b	37.5ab	21.3a	35.0ab	36.3ab	32.5ab	18.8a	26.3ab
Enjoyable	31.3a	27.5a	18.8a	21.3a	27.5a	31.3a	26.3a	25.0a
Active	13.8a	16.3a	6.3a	18.8a	11.3a	12.5a	13.8a	16.3a
Interested	33.8a	30.0a	22.5a	20.0a	22.5a	32.5a	22.5a	20.0a
Nurturing	13.8a	16.3a	15.0a	7.5a	21.3a	15.0a	12.5a	13.8a
Guilty	1.3a	0.0a	5.0a	7.5a	0.0a	3.8a	1.3a	1.3a
Regret	11.3a	1.3a	8.8a	7.5a	2.5a	3.8a	3.8a	10.0a
Sad	3.8a	5.0a	6.3a	7.5a	2.5a	5.0a	5.0a	6.3a
Worried	2.5a	5.0a	3.8a	6.3a	1.3a	1.3a	2.5a	5.0a
Disgusted	3.8a	2.5a	7.5a	8.8a	0.0a	2.5a	2.5a	7.5a
Neutral	26.3ab	27.5ab	30.0ab	16.3a	28.8ab	21.3ab	37.5b	22.5ab
Bored	7.5a	10.0a	18.8a	18.8a	13.8a	6.3a	21.3a	13.8a
Hate	1.3a	2.5a	5.0a	5.0a	2.5a	3.8a	5.0a	6.3a
Unpleasant	8.8a	16.3a	20.0a	21.3a	6.3a	12.5a	15.0a	20.0a
Comforting	26.3b	16.3ab	10.0ab	13.8ab	21.3ab	15.0ab	16.3ab	6.3a

Frequencies (%) with different letters in each row indicate significant differences ($p \leq 0.05$). CGB = coconut + goji berry with dark chocolate; CDC = coconut and dark chocolate with freeze-dried raspberries; CR = cranberry + raspberry; SC = salted caramel.

emotional terms “nurturing”, “comforting”, “satisfied”, “enjoyable”, “calm”, and “interested”. Samples SC and CDC in the blind session were related to emotional terms “hate”, “bored” and “neutral”, whereas, in the informed session, SC and CDC were associated with emotional terms “sad”, “unpleasant”, “worried”, “regret”, “active”, “guilty” and “disgusted”. Overall, regardless of the session (blind or informed), positive emotional terms were associated with the sample CGB and CR, and, on the other hand, negative emotional terms were related with the samples CDC and SC. There was no significant difference between the

emotions perceived by participants while consuming the samples when the information was provided.

3.3. Purchase intent

The frequency of purchase intent for each sample in the blind and informed condition has been calculated and summarized in Table 4. The highest purchase intent was observed for the cranberry-raspberry (CR) sample and the lowest for the salted caramel (SC) sample. In the case of

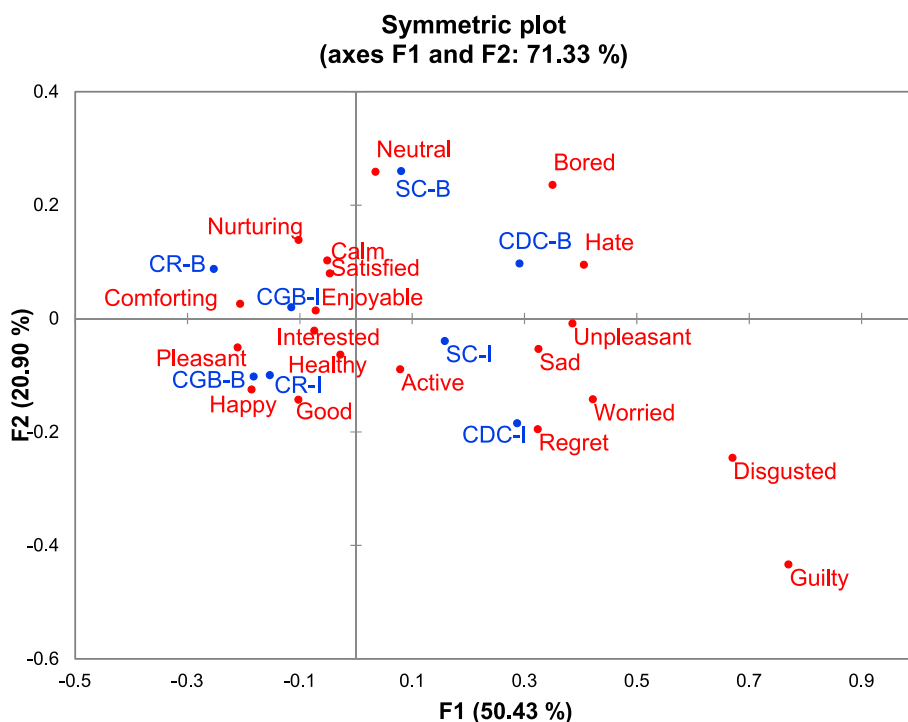


Fig. 4. Correspondence analysis of emotion terms for the protein bars in the blind and informed session. CGB = coconut + goji berry with dark chocolate; CDC = coconut and dark chocolate with freeze-dried raspberries; CR = cranberry + raspberry; SC = salted caramel. B = blind condition session; I = informed condition session.

Table 4
Frequency (%) of purchase intention of participants for protein bars in blind and informed session.

	CGB		CDC		CR		SC	
	Blind	Informed	Blind	Informed	Blind	Informed	Blind	Informed
Purchase intent	62.5 ^{ab}	56.3 ^{ab}	46.3 ^{ab}	52.5 ^{ab}	66.3 ^{ab}	68.8 ^b	43.8 ^a	47.5 ^{ab}

Frequencies (%) with different letters in the row indicate significant differences ($p \leq 0.05$). CGB = coconut + goji berry with dark chocolate; CDC = coconut and dark chocolate with freeze-dried raspberries; CR = cranberry + raspberry; SC = salted caramel.

the other three samples (CDC, CR and SC), there were no significant effects ($p > 0.05$) of the claims on the purchase intention.

Studies show that there is a relationship between the intention of buying healthy products and the cognition of emotions [24]. The arousal of positive emotions while consuming food products tends to have higher purchase intent as compared to negative emotions. As seen in the present study, protein bars CGB and CR were more associated with positive emotions such as “happy”, “satisfied”, “pleasant”, “enjoyable”, “active”, “good” and others, hence had higher purchase intent among consumers compared to the protein bars CDC and SC as these were more related with negative emotions such as “guilty”, “bored”, “hate” “regret” and others by the consumers. This showed that there are some associations between flavors and emotions, which individuals can perceive [25]. According to Pinto, de Oliveira Freitas et al. (2017), consumers do not depend totally on the health claim information provided while purchasing the food items as the taste and flavor also play an important role. Health claims mainly come into consideration depending on the individual need; for example, medical recommendations [26]. The health claims are not capable of changing the hedonic responses towards the food product as consumers do not prefer sacrificing sensory pleasure for the sake of health benefits [27,28].

4. Conclusion

In the current study, it was observed that there was no effect of health claims on consumers’ acceptability of protein bars. Overall, the

main driver of the difference in the results was the product, as participants preferred the taste, flavor, and texture of protein bars rather than the health claims conveyed to them. Consumer characteristics such as expectations, familiarity, and believability in the information associated with the food product may moderate the impact and efficiency of health claims. Also, there were no significant changes observed in the emotions and purchase intent of consumers when the health claim information was delivered. The highest purchase intent was associated with positive emotions.

5. Limitations

The textual form of health claims on plain paper could be a major limiting factor as consumers usually associate health claims with the actual package, which may further have font emphasisation or cartoon characters to influence consumers. The number of participants and more segregated populations could reveal more interesting results in future studies. The differences in the intrinsic culture among the group of participants could be the differentiating factors in the choices among consumers. Moreover, the majority (77.5%) of participants were less than 35 years of age, studies show the younger population is less interested in health-related information to make food choices as compared to people over 35 years of age.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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