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Seasonal multisensory eating experiences in Norway and Colombia

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ABSTRACT

Research on multisensory food perception suggests that most of our senses can influence eating experiences (Spence, 2020). The present research evaluates how different senses are engaged across country-specific eating experiences. Our goal is to explore each country's prototypical multisensory eating experience throughout the seasons. In Study 1A and 1B, we used the Sensory Perception Item (SPI) scale by Haase and Wiedmann (2018) in Norway ($n = 104$, M age $= 40.73$) and Colombia ($n = 130$, M age $= 37.81$), to assess how visual, auditory, tactile, olfactory, and gustatory dimensions are engaged in each country's specific eating experiences and across seasons (Norway: Summer, Autumn, Winter, Spring; Colombia: Humid, Dry, Cold, Hot). All of the sensory dimensions in Norway, except touch, were significantly influenced by seasons. In Colombia, seasons and climates were only significant for touch and olfaction. In Study 2A and 2B, we evaluated specific sensory components of the eating experiences in Norway ($n = 83$, M age $= 39.1$) and Colombia ($n = 64$, M age $= 40.64$). Seasons significantly affected several sensory dimensions of the eating experiences in Norway but not in Colombia. Furthermore, we obtained keywords that reflected participants eating experiences across the four seasons. This study provides insights on how the statistical regularities of food experience environments might change throughout certain seasons, climates, and geographical contexts. Restaurant managers can think of changing the ambience settings of the dining rooms to match the image people associate with each season, transferring the external environment into the internal dining atmosphere as one of the innovative ways to enhance eating experiences.

1. Introduction

Our experiences with food are multisensory in nature (Spence, 2015). That is, they are formed through the interaction between various senses across different stages of consumption. Not only does the taste of the food influence how much we enjoy the meal but so do other contextual elements, such as the table settings, background music, dining room decoration, and the signature scents of the location (Spence, 2017). In that sense, our eating experiences are affected by both the intrinsic elements of food (e.g., taste and smell) and the external factors associated with eating (e.g., atmospheric sounds, see Betancur et al., 2020; Wang et al., 2019). Previous research shows that the immediate eating contexts (e.g., restaurant settings) influence the eating experience (Kauppinen-Räisänen et al., 2013; Ryu & Han, 2011). What has not been thoroughly investigated is the effect of non-immediate environmental factors such as climate conditions and seasonal changes. In other words, research is needed to clarify how our senses may be engaged differently in our eating experiences throughout the seasons as well as the sensory elements that we associate with said experiences in each of the seasons (Spence, 2021). Given that physical environments such as climate conditions or seasonal changes have a profound effect on multisensory landscapes (Lightner & Rand, 2014; Seo et al., 2014; Wada et al., 2012; Young et al., 2003), we postulate that these environmental changes might consequently affect not only the availability of food but also the sensory attributes that we associated with the eating experience.

In the present research, we explore the multisensory aspects of eating experiences and their associations related to seasonal changes. Furthermore, due to the diverse natural and social conditions, people in different countries may experience seasonal changes differently. Therefore, to validate such claims we conducted two studies in Norway and Colombia. We selected these two countries since they are distinctive regarding climate conditions and the level of the remarked seasonal changes (geographically speaking, Colombia is near the Equator, whereas Norway is further north). In the first study, we examine how the different senses are generally engaged, in terms of intensity, during the

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eating experiences throughout the seasons in these two countries. In the second study, we go beyond sensory engagement by exploring sensorial associations, i.e., examining how specific elements of an eating experience might be differently regarded in each season, by Norwegians and Colombians.

The present study is mainly exploratory and conceptual. First, we present the current literature on multisensory eating experiences, laying out the potential theoretical gap on how physical environments play a major role in forming the associations that the sensory elements share with the eating experiences. Then, we discuss how multisensory associations are built through the associative learning process. After that, we present our studies and use their results to discuss and explain seasonal eating experiences.

2. Multisensory eating experiences

Our eating experiences are dynamically constituted by diverse sensory cues (Spence, 2015, 2020). These sensory cues can be classified into either *intrinsic* or *extrinsic* factors (see Wang et al., 2019, for a review). *Intrinsic* factors refer to the food's characteristics such as taste, smell, and mouthfeel (Enneking et al., 2007; Prescott, 2015). *Extrinsic* factors are those elements that are not directly related to the consumed food, such as packaging and food containers, the table settings, lighting, and music (e.g., Spence et al., 2019; Velasco et al., 2018).

Crafting sensory characteristics for multisensory eating experiences is becoming a trend in various food sectors (Spence & Youssef, 2019; Velasco & Obrist, 2021). For example, Spence and Youssef (2019) presented different dishes combining flavour profiles with various multisensory enhancement techniques. Intriguingly, the "Sonic sip" dish stimulated guests' eating experience with sour and spicy music, creating synaesthetic eating experiences when flavours and music blended well together.

Indeed, multisensory eating experiences can be both carefully crafted and formed naturally. Just think of a typical eating experience in your country. Think not only about the food itself but also the setting, the plate/tableware, the lighting conditions, and the music. Think about the environment, the seasons, and the atmosphere. There are probably some nostalgic eating experiences or maybe some food you crave at a particular event or time that easily comes to your mind. Most of these experiences are naturally formed and not crafted by design.

Building on the literature on multisensory marketing and experiences, the current study investigates how different senses might be more or less intensely engaged in the prototypical eating experiences in Norway and Colombia (Study 1), as well as what specific sensory elements might be associated with these experiences (Study 2) (Fenko et al., 2010; Velasco & Obrist, 2020; Velasco & Spence, 2019).

2.1. The role of terroir in forming the multisensory associations

Terroir is an essential concept for the constitution of eating experiences (Charters et al., 2017). The term terroir encompasses two dimensions: *natural* and *human factors* (Lenglet, 2014). While natural factors include specific attributes such as the soil and the climate, human factors are characterised by human expertise, history, culture, and tradition. Food research has delved into both dimensions of terroir and their roles in different aspects of the product experiences, including produce preferences, produce assessments, and product terroir congruency (Feldmann & Hamm, 2015; Fischer et al., 1999; Pouta et al., 2010). Most of the research is on the link between terroir and production. A terroir has specific soil, temperature, and sunlight that influence the quality of produce and the end product (Trubek, 2008). For instance, the Champagne area in France is famous for producing high-standard winery products, Champagne (Wilson, 1998). However, terroir characteristics are not constant throughout the year (Omer et al., 2018) and the context in which we consume food also change with the seasons. As a result, we articulate that seasonal changes have an impact on our eating experiences through the sensory elements that we associate with those changes.

2.2. The impact of seasons on eating experiences

Previous research has explored how physical environments influence people's moods, feelings, and behaviours (Oishi, 2014). The contextual factors do not only convey but also influence our sensory engagement and judgment of the eating experiences (Cardello, 1995). Furthermore, understanding how people associate specific sensory elements with their eating experiences across seasons can reveal distinctive cross-modal effects that seasonal characters can bring to the eating experience. Some sensory features of seasons that are not directly linked to any food and beverage may have a surprise effect on our eating experiences. For instance, the impact of auditory factors within the eating environment on multisensory eating experiences has been documented in previous research (Spence et al., 2019), despite the fact that sound is not typically considered a primary factor in this context.

The *associative learning theory* was utilised to explain why people might associate specific senses and sensory cues with their eating experiences across seasons. We learn to map sensory characteristics and concepts through associative learning (Aldridge et al., 2009; Mitchell et al., 2009). We develop our taste familiarity throughout life experiences with the involvement of multisensory interactions, and memories are formed and strengthened through repeated exposure to these experiences (Hockley & Consoli, 1999; Mitchell et al., 2009). Our daily experiences are not constant throughout the year. They often vary across seasons. For instance, we eat seasonally available food and gain memories of these multisensory eating experiences in each season. Such multisensory experiences derive not only from the food we eat but also from the context in which the food is consumed, such as the surrounding environments featuring seasonal changes. The underlying mechanism is that we develop the memory of our eating experiences with the engagement of multiple senses through multiple eating events that repeat over time (Epstein et al., 2009).

2.3. The present research

We conducted four exploratory studies with participants from Norway and Colombia. We selected these two countries located geographically far apart, with different climate conditions to examine whether different seasonal and context changes influence the associations people have with their eating experiences. Norway is located in the far north and has four distinct seasons with a long winter (O'Brien et al., 2006). In Colombia, the differences between seasonal features are less noticeable and qualitatively different from those in Norway. Therefore, we postulated that people in Norway and Colombia would not have the same eating experiences associated with their country's seasons, and the strength of sensory engagements may be less distinct among seasons in Colombia compared to Norway's seasons.

3. Study 1: Sensory engagement in Norway and Colombia

3.1. Methods and materials

Both Study 1A and 1B were conducted on 7th April 2021. The general study settings, procedure, and analyses were similar for both studies. The main differences were languages, seasons, and participants. In Study 1A, we recruited Norwegian participants, who answered the survey in Norwegian, whereas in Study 1B, we recruited Colombian participants, who answered the survey in Spanish (See Appendix A2 for the Survey's English version). Since Colombia does not have the same seasons as Norway (Summer, Autumn, Spring, Winter), the seasons and contexts used in Study 1B consisted of Hot, Humid, Cold, and Dry. We chose these seasons (humid, dry) and contexts (hot, cold) as Colombia's climate varies across the year with a combination of levels of humidity

(i.e., dry versus humid depending on the month), and with different altitudes relative to the sea level (i.e., warmer at lower altitudes versus colder at higher altitudes).

3.1.1. Participants

Participants were recruited from an online data panel (Dynata, https://www.dynata.com/) to take part in Study 1A (Norwegian participants) and Study 1B (Colombian participants). The studies were designed and performed on Qualtrics XM platform (https://www.qualtrics.com/uk) and lasted for approximately six minutes, on average. After excluding those who could not finish the survey, the resulting sample sizes consisted of one hundred and four participants in Study 1A ($n_{recruited} = 114$, $n_{final} = 104$, Age range = 18–65, M age = 40.73, SD = 13.30, Females = 50%), and one hundred and thirty participants in Study 1B ($n_{recruited} = 197$, $n_{final} = 130$, Age range = 18–65, M age = 37.81, SD = 13.03, Females = 33%).

3.1.2. Apparatus and materials

For Study 1, we utilised the Sensory Perception Item Set (SPI) scale proposed by Haase and Wiedmann (2018), consisting of twenty main items describing the experiences that appeal to the five senses. Developed through literature search, expert interviews, and reliability/validity testing, the SPI was also evaluated through three studies and proven to be reliable, valid, and consistent (*Cronbach's alphas* > 0.8, *AVEs* > 0.6, *rs* > 0.5). (See Haase & Wiedmann, 2018 for details).

The four blocks of five items for each of the four seasons were utilised in this questionnaire. The items comprised five sensory dimensions (*visual*: aesthetic, attractive, beautiful, pretty; *auditory*: euphonic, good-sounding, melodic, sonorous; *tactile*: comfortable, soothing, handy, well-shaped; *olfactory*: fragrant, nice-smelling, perfumed, scented; and *gustatory*: appetizing, flavourful, palatable, tasty). These items measured the level of engagement of each of the senses in the context of each country's eating experiences. We used seven-point Likert scales to record the participants' responses ranging from Strongly Disagree (1) to Strongly Agree (7). (See Appendix A).

3.1.3. Procedure

The study followed a one-factor (seasons) within-participants experimental design. After participants agreed to take part in the study (by signing a standard consent form), they were asked demographic questions (gender, age, number of years living in Norway/Colombia, and what region of Norway/Colombia they were from). Then they were directed to read the following excerpt: *'We will ask you to evaluate, in general, your typical Norwegian/Colombian eating experiences in different seasons. Please note that the survey is not about the food itself but about everything else associated with the eating experience. Please think about what characterises these experiences across the four seasons,* i.e., *summer, autumn, winter, and spring (Study 1A) or hot, humid, cold, and dry (Study 1B). There are no right or wrong answers to the questions, please answer with what best describes how you feel.'*

Next, they completed the same items for each season. While answering, they were asked to imagine themselves in a representative eating experience across four seasons and, instead of thinking about the food, they were instructed to think about the atmosphere, the elements in it, the people, the emotions and most importantly, and what makes these experiences distinctive. (See Appendix A)

3.1.4. Data analysis

We conducted a one-factor (four levels of seasons) repeated measures analysis of variance (ANOVA) to investigate the influence of seasons on the different associations that participants had with their Norwegian and Colombian eating experience. We analysed people's associations between the senses (visuality, odour, taste, touch, and sound) and the seasons. Furthermore, following the approach provided by Haase and Wiedmann (2018), the average score of the values related to the five senses is defined as a sensory composite score, ranging from 1: the least to 7: the most engagement. We applied the post hoc pairwise comparisons using the Bonferroni correction method to adjust the significance level and control for Type I and Type II errors (Mudge et al., 2017).

In addition, we conducted an auxiliary analysis to compare the engagement of the sensory dimensions on the eating experiences between the two countries' participants. First, we averaged the ratings of four seasons to generate the general scores reflecting the eating experiences at the country level. Following that, we performed a t-independent sample test with countries (Norway vs. Colombia) as a between-subject factor, and the repeated measures factors included senses such as visual, auditory, tactile, olfactory, gustatory, and sensory composite score. All of the analyses were performed using SPSS version 28.

3.2. Results

3.2.1. Study 1A

Except for the sense of touch, seasons had significant influences on all the other sensory dimensions in both countries (See Table 1). In particular, the participants associated the visual dimension more strongly with eating experiences in Summer ($M = 4.64$, $SD = 1.17$) and Spring ($M = 4.65$, $SD = 1.27$) than in Autumn ($M = 4.37$, $SD = 1.15$). In terms of the auditory dimension, people associated it more strongly with eating experiences in Spring ($M = 4.49$, $SD = 1.20$) when compared to the other seasons, such as Summer ($M = 4.19$, $SD = 1.17$), Autumn ($M = 4.13$, $SD = 1.23$) and Winter ($M = 4.21$, $SD = 1.17$). When asked about olfaction, participants associated the Summer ($M = 4.57$, $SD = 1.05$) over the Winter ($M = 4.31$, $SD = 1.21$) more strongly with their eating experiences. In addition, most participants reported better food taste experience in the Summer ($M = 5.20$, $SD = 1.18$) compared to the Winter ($M = 4.90$, $SD = 1.25$). Finally, the sensory perception composite score suggested that the association between eating experience in the Autumn ($M = 4.49$, $SD = 0.99$) was not as positive as in the Summer ($M = 4.65$, $SD = 0.96$) and Spring ($M = 4.64$, $SD = 1.09$). However, the pairwise differences among seasons for the sensory perception composite score were not statically significant ($p > .05$). These results were summarily illustrated in Fig. 1.

3.2.2. Study 1B

The main effect of seasons was significant for the senses of touch and olfaction (See Table 2). In particular, the Colombians associated the tactile elements of the eating experience more strongly with the Cold season ($M = 5.56$, $SD = 1.26$) than the Humid season ($M = 5.31$, $SD = 1.31$). In the aromatic dimension, participants reported that they associated their eating experience more strongly with the Cold season ($M = 5.57$, $SD = 1.15$) than with the Humid season ($M = 5.29$, $SD = 1.23$). The associations between seasons and visual, sound, and taste components of the Colombian eating experience were not statistically significant ($p > .05$). There was also no significant variation across seasons with regard to the sensory composite scores ($p > .05$). The results were illustrated in Fig. 2.

3.2.3. Norway vs. Colombia

When we compared the general eating experiences between the two countries, we found that Colombian participants associated eating experiences more with the five basic senses than Norwegian participants ($ps < 0.001$, see Table 3).

3.3. Discussion

The findings suggested that the impact of seasons on eating experiences varies across different countries (Norway versus Colombia). For Norway, Summer was strongly associated with better taste and aroma, whereas Spring was associated more positively with the auditory dimension of eating experiences. Appropriately, the unique characteristics of each season together might influence our moods, sensory sensitivities, and other contextual factors of eating experiences. Previous

Table 1
Mean SPI ratings in Norway in Study 1A.

	Summer		Autumn		Winter		Spring		Main effect (n = 104)		
Senses	M	SD	M	SD	M	SD	M	SD	F	*p*	*partial* eta squared
Visual	**4.64^{a,b}**	**1.17**	**4.37^{c}**	**1.15**	**4.45^{a,c,d}**	**1.29**	**4.65^{b,d}**	**1.28**	**3.699**	**0.012**	**0.035**
Auditory	**4.19^{a}**	**1.17**	**4.13^{a}**	**1.23**	**4.21^{a}**	**1.17**	**4.50^{b}**	**1.21**	**5.468**	**0.001**	**0.050**
Tactile	4.62^{a}	1.14	4.58^{a}	1.22	4.58^{a}	1.33	4.57^{a}	1.34	0.128	0.944	0.001
Olfactory	**4.57^{a}**	**1.06**	**4.38^{a,b}**	**1.10**	**4.31^{b}**	**1.21**	**4.51^{a,b}**	**1.03**	**4.121**	**0.007**	**0.038**
Gustatory	**5.20^{a}**	**1.19**	**4.98^{a,b}**	**1.16**	**4.90^{b}**	**1.25**	**4.98^{a,b}**	**1.25**	**4.341**	**0.005**	**0.040**
SCC	**4.65^{a}**	**0.96**	**4.49^{a}**	**0.99**	**4.49^{a}**	**1.07**	**4.64^{a}**	**1.09**	**3.753**	**0.011**	**0.035**

Note. A repeated measure ANOVA was performed with seasons as a within-subject factor. The repeated measured factors include senses such as visual, auditory, tactile, olfactory, gustatory, and sensory composite score (SCC). Values in **bold** indicate a main significant difference. Values within each row not sharing a superscript letter are significantly different (p <.05) as per post hoc multiple pairwise comparisons using Bonferroni-adjusted tests. *Partial* eta squared indicates the effect size.

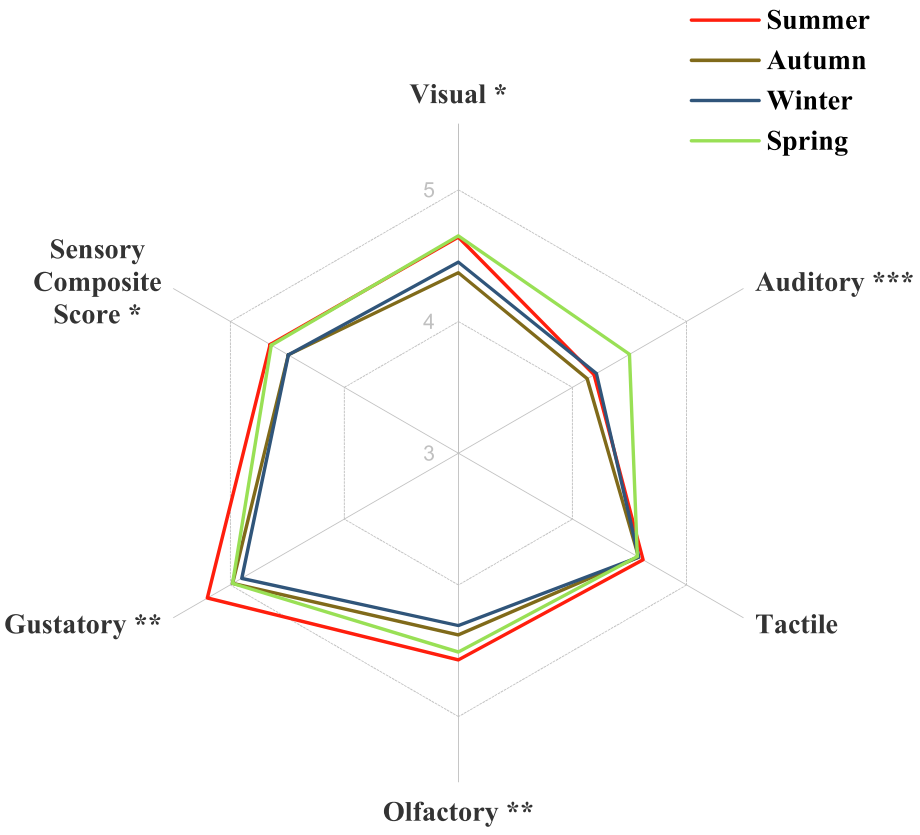

Fig. 1. The sensory engagements of eating experiences in Norway in Study 1A. (The figure shows average scores for each dimension with 1: least to 7: most engagement. * p <.05, **p <.01. ***p <.001).

Table 2
Mean SPI ratings in Colombia in Study 1B.

	Humid		Dry		Cold		Hot		Main effect (n = 130)		
Senses	M	SD	M	SD	M	SD	M	SD	F	*p*	*partial* eta squared
Visual	5.38^{a}	1.20	5.44^{a}	1.24	5.39^{a}	1.40	5.49^{a}	1.16	0.541	0.654	0.004
Auditory	5.36^{a}	1.19	5.48^{a}	1.23	5.52^{a}	1.17	5.53^{a}	1.28	1.307	0.272	0.010
Tactile	**5.31^{a}**	**1.31**	**5.45^{a,b}**	**1.31**	**5.56^{b}**	**1.26**	**5.52^{a,b}**	**1.28**	**2.725**	**0.044**	**0.021**
Olfactory	**5.29^{a}**	**1.23**	**5.46^{a,b}**	**1.16**	**5.57^{b}**	**1.15**	**5.54^{a,b}**	**1.19**	**4.007**	**0.008**	**0.030**
Gustatory	6.02^{a}	1.21	6.02^{a}	1.18	6.09^{a}	1.07	5.99^{a}	1.18	0.601	0.615	0.005
SCC	5.47^{a}	1.06	5.57^{a}	1.09	5.62^{a}	1.03	5.62^{a}	1.05	2.413	0.066	0.018

Note. N = 130. A repeated measure ANOVA was performed with seasons as a within-subject factor. The repeated measured factors include senses such as visual, auditory, tactile, olfactory, gustatory, and SCC. Values in **bold** indicate a main significant difference. Values within each row not sharing a superscript letter are significantly different (p <.05) as per post hoc multiple pairwise comparisons using Bonferroni-adjusted tests. *Partial* eta squared indicates the effect size.

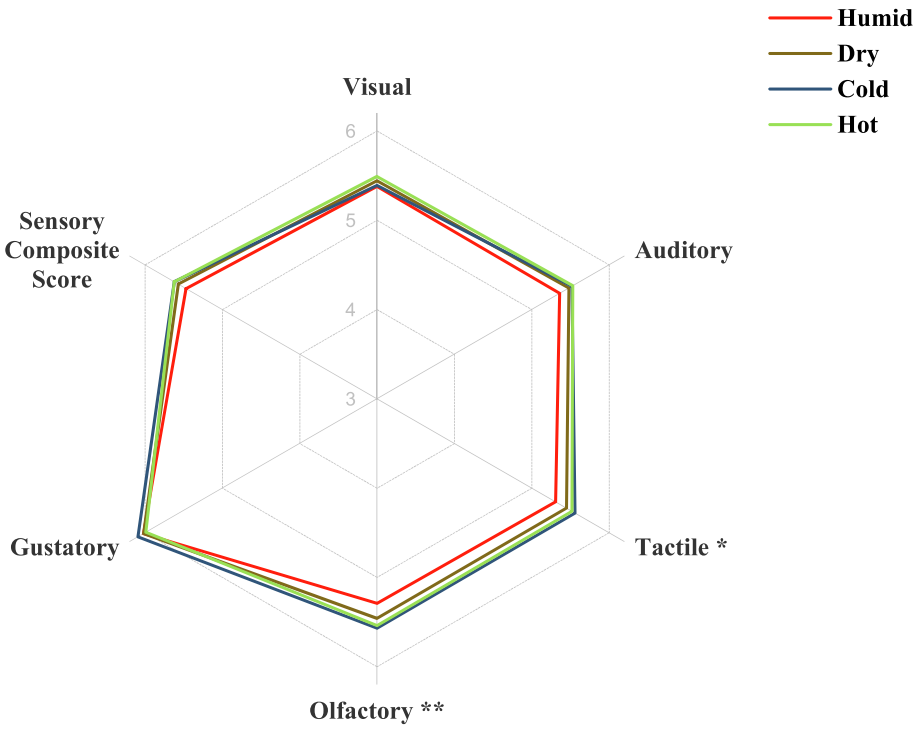

Fig. 2. The sensory engagements of eating experiences in Colombia in Study 1B. (The figure shows average scores for each dimension with 1: least to 7: most engagement. * p <.05, **p <.01. ***p <.001).

Table 3
Mean SPI ratings- Norway vs. Colombia in Study 1.

	Norway (n = 104)		Colombia (n = 130)			Main effect (n = 234)	
Senses	M	SD	M	SD	M-*diff*	*t*	*p*
Visual	**4.53**	**1.05**	**5.42**	**1.07**	**0.89**	**6.395**	**<0.001**
Auditory	**4.26**	**1.03**	**5.47**	**1.01**	**1.21**	**9.020**	**<0.001**
Tactile	**4.58**	**1.13**	**5.46**	**1.11**	**0.87**	**5.909**	**<0.001**
Olfactory	**4.44**	**0.97**	**5.46**	**1.00**	**1.02**	**7.851**	**<0.001**
Gustatory	**5.01**	**1.08**	**6.03**	**1.03**	**1.01**	**7.325**	**<0.001**
SCC	**4.57**	**0.95**	**5.57**	**0.96**	**1.00**	**7.995**	**<0.001**

Note. A *t-independent* sample test was performed with countries (Norway vs. Colombia) as a between-subject factor. Values in **bold** indicate a main significant difference. M-*diff* indicates the mean differences of sensory values between Norway and Colombia.

research has found that people were more likely to experience depression during the winter months because of reduced exposure to sunlight (Eastman, 1990). Such depression in turn drives our food choices and preferences. For instance, people often seek comfort food in the winter months (Davis, 2013). Our findings provided further evidence for the role of environmental cues in shaping our sensory experiences with food (Spence et al., 2019).

In contrast, the study did not find any significant associations between the sensory dimensions of eating experiences and seasons for Colombia, except for the tactile and olfactory dimensions. Colombians appeared to enjoy their eating experiences equally throughout the different seasons, possibly due to the limited seasonal variation in Colombia compared to Norway.

When we compared the general eating experiences between the two countries, we found that Colombian participants associated eating experiences more with the five basic senses than Norwegian participants. It is possible that the eating contexts in Colombia attract and engage different senses more strongly than the eating contexts in Norway. Otherwise, it could be that Norwegian participants simply rated their eating experiences more moderately than Colombian participants did. These potential explanations, however, require further empirical studies to ascertain their validity.

4. Study 2: Sensory elements associated with eating experiences in Norway and Colombia

Whilst Study 1 gives us a general idea of sensory engagement or dominance, that is, how each sense might be engaged in the eating experiences in each country, throughout the seasons, it does not reveal the specific sensory characteristics that may be part of the experiences. As such, in Study 2, we assessed the same populations and seasons, but we move on to identify some of the specific sensory elements associated with the eating experience. For instance, we explored how participants associated their eating experience in each season with colours, and we asked participants to write the key words describing their associations with the eating experiences across seasons. This free word association task has been known to reveal the evaluation of conceptual structures and the eating experiences in food science (Guerrero et al., 2010).

The survey was conducted in Norwegian for Study 2A and in Spanish for Study 2B. The general study settings and procedures were similar to Study 1 (See Appendix B for an English version). Both Study 2A and 2B were conducted on 7th of April 2021.

4.1. Methods and materials

4.1.1. Participants

We also recruited participants online in Study 2, which lasted for approximately 15 min. After excluding the data of those participants that did not complete the survey, data from eighty-three participants in Study 2A ($n_{recruited} = 114$, $n_{final} = 83$, Age range = 18–65, *M* age = 39.1, *SD* = 12.77, *Females* = 48.19%), and sixty-four participants in Study 2B ($n_{recruited} = 198$, $n_{final} = 64$, *Age* range = 18–65, *M* age = 40.64, *SD* = 12.61, *Females* = 32.81%) were analysed.

4.1.2. Apparatus and materials

For Study 2, we developed our own questionnaire (we named "sensory association measures") which consisted of twenty-four main items to evaluate specific associations between eating experiences throughout the seasons. The items comprised of multiple dimensions containing sub-items, for example, colour, overall ambience, touch, sound, enjoyability and word associations with the sensory elements (e.g., tactile, gustatory, olfactory, visual, and auditory) related to typical Norwegian and Colombian eating experiences. We used seven-point bipolar scales to capture the responses of the participants and free text input for the word associations. Such free association task allows participants to freely describe their eating experience without constrains (Guerrero et al., 2010) (See Appendix B). Note that these measures were included based on previous research (see introduction), though mainly as exploratory, aiming at generating new insights and identifying potential areas for further study.

4.1.3. Data analysis

In general, to test the effect of seasons on the specific sensory dimensions (i.e., ambiance, tactile, auditory, overall eating experiences) associated with the corresponding eating experiences, we conducted a one-factor (four levels of seasons) repeated measures analysis of variance (ANOVA). To analyse choices of colour, we ran Wald test to compare the estimated probabilities of choices, and the Cramer's V test to quantify the effect size. All the analyses were performed using SPSS version 28. In addition, we used R program with "Word Cloud" package to perform commonality and comparison analysis, to detect the most frequent words and the differences among seasons (Fellows, 2018).

For an auxiliary analysis, we compared the sensory dimensions of their eating experiences between the two countries' participants. We averaged the rating across four seasons to generate general scores on different sensory dimensions of the eating experiences. Using SPSS version 28, a t-independent sample test was performed with countries (Norway vs. Colombia) as a between-subject factor.

4.2. Results

4.2.1. Study 2A-Norway

4.2.1.1. The choices of colours across seasons. Fig. 3 displays and summarises the participants choices of colour across seasons. In brief, people tended to select warmer tone colours for the Sumer and Spring than for the Autumn and Winter. Participants also picked colder tone colours for the Autumn and Winter than they did for the Summer and Spring, Wald $\chi^2 = 101{,}926$, $p < .001$, Cramer's V = 0.319.

In addition, whether there was no significant impact of seasons on the perceived intensity of colours ($p > .05$), seasons affected how bright the chosen colours were to participants ($p < .05$). For instance, in Summer ($M = 5.16$, $SD = 1.41$) and Spring ($M = 5.12$, $SD = 1.55$), the chosen colours were rated as brighter than the chosen colours in the Autumn ($M = 4.04$, $SD = 1.41$) and Winter ($M = 4.13$, $SD = 1.80$).

4.2.1.2. Overall ambience. The effect of seasons on the overall ambience of the eating experience in Norway was significant (See Table 4). The results indicated that there was a significant association between the seasons and the overall ambience of the eating experience. Winter ($M = 5.36$, $SD = 1.91$) and Autumn ($M = 4.31$, $SD = 1.64$), for instance, were associated with being colder than Summer ($M = 3.48$, $SD = 1.82$) and Spring ($M = 5.36$, $SD = 1.91$). In contrast, participants associated the eating experience in Summer ($M = 4.88$, $SD = 1.52$) and Spring ($M = 4.69$, $SD = 1.23$) with being warmer than in Winter ($M = 3.18$, $SD = 1.98$) and Autumn ($M = 3.99$, $SD = 1.52$). When participants were asked how sunny they had associated the eating experience throughout seasons, Summer ($M = 5.01$, $SD = 1.31$) was the sunniest, while Winter ($M = 3.10$, $SD = 1.69$) was the darkest. Summer was also associated with the driest ($M = 3.80$, $SD = 1.33$) and least windy ($M = 3.87$, $SD = 1.41$) whereas Autumn was associated with the most humid ($M = 4.82$, $SD = 1.28$) and windy weather ($M = 4.96$, $SD = 1.24$), according to participants' report.

4.2.1.3. Tactile. The participants were asked to rate the various tactile characteristics associated with the eating experience. The results indicated that people associated seasons with the overall eating experience

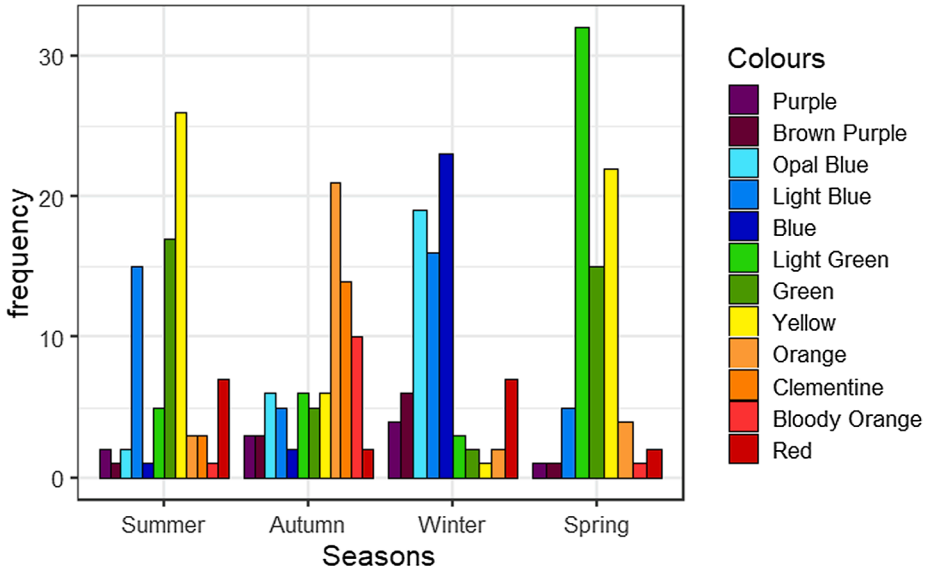

Fig. 3. Choices of colours across seasons in Norway in Study 2A.

Table 4
Sensory association measures in Norway in Study 2A.

Sensory measures		Summer		Autumn		Winter		Spring		Main effect (n = 83)		
		M	SD	M	SD	M	SD	M	SD	F	*p*	*partial* eta squared
Colours	Bright	**5.16**^{a}	**1.41**	**4.04**^{b}	**1.41**	**4.13**^{b}	**1.80**	**5.12**^{a}	**1.55**	**14.842**	**<0.001**	**0.153**
	Intensity	**4.95**^{a}	**1.36**	**4.45**^{a}	**1.44**	**4.47**^{a}	**1.68**	**4.88**^{a}	**1.48**	**3.187**	**0.024**	**0.037**
Ambience	Cold	**3.48**^{a}	**1.82**	**4.31**^{b}	**1.64**	**5.36**^{c}	**1.91**	**3.53**^{a}	**1.33**	**22.620**	**<0.001**	**0.216**
	Warm	**4.88**^{a}	**1.52**	**3.99**^{b}	**1.52**	**3.18**^{c}	**1.98**	**4.69**^{a}	**1.23**	**22.861**	**<0.001**	**0.218**
	Wind	**3.87**^{a}	**1.41**	**4.96**^{b}	**1.24**	**4.80**^{b}	**1.69**	**4.43**^{b}	**1.38**	**11.946**	**<0.001**	**0.127**
	Humid	**3.80**^{a}	**1.33**	**4.82**^{b}	**1.28**	**4.51**^{b,c}	**1.83**	**4.28**^{a,c}	**1.41**	**9.242**	**<0.001**	**0.101**
	Sunny	**5.01**^{a}	**1.31**	**3.63**^{b}	**1.33**	**3.10**^{c}	**1.69**	**4.87**^{a}	**1.34**	**44.541**	**<0.001**	**0.352**
Tactile	Smooth	4.30^{a}	1.45	3.88^{a}	1.35	4.41^{a}	1.89	4.30^{a}	1.49	2.261	0.082	0.027
	Light	**5.02**^{a}	**1.31**	**3.64**^{b}	**1.11**	**3.34**^{b}	**1.82**	**4.81**^{a}	**1.41**	**29.733**	**<0.001**	**0.266**
	Curve	**4.49**^{a,b}	**1.19**	**4.00**^{a,c}	**1.17**	**3.78**^{c}	**1.65**	**4.54**^{b}	**1.36**	**6.894**	**<0.001**	**0.078**
	Loose	**4.19**^{a,b}	**1.43**	**3.96**^{a}	**1.13**	**3.76**^{a}	**1.49**	**4.43**^{b}	**1.18**	**4.526**	**0.004**	**0.052**
	Cold	**3.36**^{a}	**1.55**	**4.27**^{b}	**1.41**	**5.01**^{c}	**1.76**	**3.70**^{a}	**1.30**	**20.104**	**<0.001**	**0.197**
	Small	4.00^{a}	1.33	3.86^{a}	1.18	3.86^{a}	1.66	3.88^{a}	1.28	0.269	0.848	0.003
	Glossy	**4.54**^{a}	**1.38**	**3.99**^{b}	**1.28**	**3.99**^{a,b}	**1.54**	**4.27**^{a,b}	**1.14**	**3.882**	**0.010**	**0.045**
Auditory	Bass	**3.96**^{a}	**1.51**	**4.46**^{a,b}	**1.31**	**4.83**^{b}	**1.58**	**3.93**^{a}	**1.43**	**8.572**	**<0.001**	**0.095**
	Silent	**4.22**^{a,b}	**1.33**	**4.41**^{a,b}	**1.30**	**4.53**^{a}	**1.48**	**3.90**^{b}	**1.34**	**3.646**	**0.013**	**0.043**
	Slow	**4.65**^{a}	**1.40**	**4.46**^{a}	**1.20**	**4.84**^{a}	**1.50**	**4.27**^{a}	**1.26**	**3.221**	**0.023**	**0.038**
	Musical	**4.59**^{a}	**1.34**	**4.18**^{a,b}	**1.31**	**3.80**^{b}	**1.52**	**4.46**^{a}	**1.47**	**6.743**	**<0.001**	**0.076**
	Pleasant	**5.35**^{a}	**1.37**	**4.53**^{b,c}	**1.30**	**4.34**^{b}	**1.70**	**5.01**^{a,c}	**1.29**	**10.740**	**<0.001**	**0.116**
	Arousing	**3.94**^{a,b}	**1.58**	**3.54**^{a,c}	**1.65**	**3.31**^{c}	**1.67**	**4.25**^{b}	**1.64**	**8.601**	**<0.001**	**0.095**
Overall	Social	**5.53**^{a}	**1.29**	**4.52**^{b}	**1.44**	**4.46**^{b}	**1.65**	**5.16**^{a}	**1.32**	**15.430**	**<0.001**	**0.158**
	Pleasant	**5.59**^{a}	**1.17**	**4.75**^{b,c}	**1.29**	**4.37**^{b}	**1.58**	**5.16**^{c}	**1.28**	**19.250**	**<0.001**	**0.190**
	Arousing	**3.99**^{a}	**1.75**	**3.58**^{b}	**1.55**	**3.29**^{b}	**1.85**	**4.08**^{a}	**1.70**	**8.391**	**<0.001**	**0.093**
	Cosy	**5.83**^{a}	**1.33**	**4.96**^{b}	**1.29**	**4.88**^{b}	**1.44**	**5.36**^{b}	**1.34**	**15.479**	**<0.001**	**0.159**

Note. A repeated measure ANOVA was performed with seasons as a within-subject factor. The repeated measured factors include senses such as visual, auditory, tactile, ambiance and overall eating evaluation. Values in **bold** indicate a main significant difference. Values within each row not sharing a superscript letter are significantly different (p <.05) as per post hoc multiple pairwise comparisons using Bonferroni-adjusted tests. *Partial* eta squared is the effect size.

connected to tactile except for the smoothness and size (p >.05). In particular, the eating experiences in Summer (M = 5.02, SD = 1.31) and Spring (M = 4.81, SD = 1.41) were associated with being lighter than eating experiences in the Winter (M = 3.34, SD = 1.82) and Autumn (M = 3.64, SD = 1.11). When asked about the association between curvature of the eating experience with seasons, participants associated the Spring (M = 4.54, SD = 1.36) as the roundest, followed by Summer (M = 4.49, SD = 1.19), Autumn (M = 4.00, SD = 1.17), and Winter (M = 3.78, SD = 1.65). Furthermore, eating experiences in Summer (M = 4.54, SD = 1.38) and Spring (M = 4.27, SD = 1.14) were also associated with being glossier than the eating experiences in Winter (M = 3.99, SD = 1.54) and Autumn (M = 3.99, SD = 1.28). Participants likewise associated the eating experiences in Summer (M = 4.19, SD = 1.43) and Spring (M = 4.43, SD = 1.18) with being looser than the eating experiences in Autumn (M = 3.96, SD = 1.13) and Winter (M = 3.76, SD = 1.49). When asked how they associated the tactile temperature of their eating experiences throughout the year, participants associated the Winter (M = 5.01, SD = 1.76) with being coldest, followed by Autumn (M = 4.27, SD = 1.41), Spring (M = 3.70, SD = 1.30), and Summer (M = 3.36, SD = 1.55).

4.2.1.4. Auditory. Participants were also asked to report their eating experiences associated with different auditory elements in each season. The results indicated that seasons had a significant association with the eating experiences connected to sound. In the Winter (M = 4.83, SD = 1.58) and Autumn (M = 4.46, SD = 1.31) the eating experiences were associated more bass (i.e., lower pitch/frequencies ranges) sound than in the Summer (M = 3.96, SD = 1.51) and Spring (M = 3.93, SD = 1.43). Winter (M = 4.53, SD = 1.48) and Autumn (M = 4.41, SD = 1.30) were associated with being quieter than Spring (M = 3.90, SD = 1.34). Participants also said that they associated the music speed with being slower in the Winter (M = 4.84, SD = 1.50) than in the Spring (M = 4.27, SD = 1.26). When asked about the musical element of the eating experiences, participants associated Summer (M = 4.59, SD = 1.34) and Spring (M = 4.46, SD = 1.47) with being more musical than Winter (M = 3.80, SD = 1.52) and Autumn (M = 4.18, SD = 1.31). When asked about the pleasantness of sound, participants associated Summer (M = 5.35, SD = 1.37) and Spring (M = 5.01, SD = 1.29) with being more pleasant compared to Winter (M = 4.34, SD = 1.70) and Autumn (M = 4.53, SD = 1.30). Similarly, in the Spring (M = 4.25, SD = 1.64) and Summer (M = 3.94, SD = 1.58) participants associated these seasons as higher in terms of audible arousal, than in the Autumn (M = 3.54, SD = 1.65) and Winter (M = 3.31, SD = 1.67).

4.2.1.5. Overall eating experiences. Participants were also asked about the social and hedonic aspect of their eating experience over the year. Summer (M = 5.53, SD = 1.29) and Spring (M = 5.16, SD = 1.32) eating experiences were associated with being more sociable than Autumn (M = 4.52, SD = 1.44) and Winter (M = 4.46, SD = 1.65). Similarly, the highest pleasant experience participants reported was in Summer (M = 5.59, SD = 1.17) and the least was in Winter (M = 4.37, SD = 1.58). However, when it came to arousal, Spring (M = 4.08, SD = 1.70) had the highest corresponding ratings, while Winter (M = 3.29, SD = 1.85) had the lowest. Finally, participants associated the most cosiness with the Summer (M = 5.83, SD = 1.33), followed by Spring (M = 5.36, SD = 1.34), Autumn (M = 4.96, SD = 1.29), and Winter (M = 4.88, SD = 1.44).

4.2.1.6. Free association word analysis. Participants were asked to make a list of words that they would associate with the typical Norwegian eating experience. These results revealed that, for each season, participants listed some enticing terms. “Fantastic”, “grill”, “enjoyable”, “meat”, “shrimps”, “outdoor life”, “insects”, “latte”, and “waves” were among the words most connected with summer eating experiences. For the Autumn season, the most associated terms were “wind”, “rain”, “grown”, “mushroom”, “leaves”, “Halloween”, and “wet”. In the Winter, the most connected words were “cold”, “white”, “dark”, “Christmas”, “cacao”, “pinnekjøtt” (salted lamb ribs), “ribbe” (Norwegian pork roast), “heavy”, and “firewood”. “Sun”, “green”, “light”, “flowers”, “blueberries”, “bright”, “fresh”, “gold”, and “soft” were the words that most came to participants’ minds while thinking of Spring. (See Fig. 4 in the Appendix C)

The commonality analysis also revealed several words associated

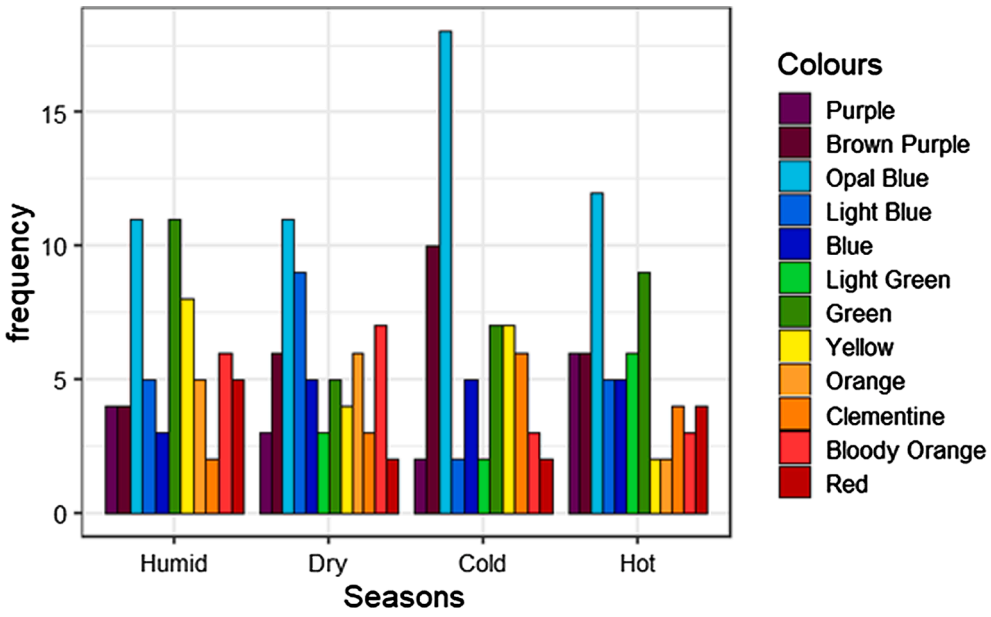

Fig. 6. Choices of colours across seasons in Colombia in Study 2B.

Table 5
Sensory association measures in Colombia in Study 2B.

Sensory measures		Humid		Dry		Cold		Hot		Main effect (n = 64)		
		M	SD	M	SD	M	SD	M	SD	F	*p*	*partial* eta squared
Colours	Bright	4.55	1.76	4.48	1.99	4.38	2.14	4.58	2.14	0.234	0.872	0.004
	Intensity	5.25	1.52	4.94	1.92	4.91	1.87	4.97	1.91	0.992	0.398	0.015
Ambience	Cold	4.44	1.86	4.56	1.95	4.91	1.99	4.55	2.03	1.150	0.330	0.018
	Warm	**3.97^{a,b}**	**2.12**	**4.34^{a,b}**	**1.98**	**3.86^{a}**	**2.11**	**4.70^{b}**	**1.95**	**3.734**	**0.012**	**0.056**
	Wind	4.17	1.58	4.56	1.70	4.48	1.58	4.58	1.70	1.374	0.252	0.021
	Humid	5.20	1.53	5.27	1.51	4.98	1.85	5.42	1.40	1.561	0.200	0.024
	Sunny	3.39	1.93	3.80	2.07	3.69	2.04	3.91	2.04	1.647	0.180	0.025
Tactile	Smooth	4.81	1.52	4.47	1.84	4.55	1.86	4.41	1.79	1.106	0.348	0.017
	Light	4.13	1.66	4.08	1.95	4.22	1.79	3.95	1.80	0.415	0.743	0.007
	Curve	4.33	1.37	4.25	1.47	4.03	1.52	4.58	1.48	2.268	0.082	0.035
	Loose	3.94	1.64	3.94	1.66	4.08	1.90	4.20	1.70	0.466	0.706	0.007
	Cold	3.86	1.95	4.56	2.08	4.44	2.11	4.08	1.99	2.430	0.067	0.037
	Small	3.81	1.51	4.08	1.59	3.77	1.73	4.13	1.60	1.218	0.305	0.019
	Glossy	3.78	1.77	3.98	1.81	3.81	1.97	4.05	1.90	0.509	0.677	0.008
Auditory	Bass	4.05	1.61	4.09	1.76	4.45	1.59	4.27	1.65	1.312	0.272	0.020
	Silent	4.25	1.68	4.02	1.94	4.38	1.83	4.28	1.79	0.910	0.344	0.014
	Slow	4.67	1.63	4.25	1.83	4.59	1.69	4.48	1.69	1.538	0.206	0.024
	Musical	4.67	1.63	4.55	1.92	4.36	1.96	4.44	1.73	0.834	0.477	0.013
	Pleasant	4.92	1.67	4.94	1.74	4.94	1.88	4.80	1.77	0.285	0.836	0.005
	Arousing	4.59	1.59	4.67	1.86	4.63	1.85	4.61	1.80	0.051	0.985	0.001
Overall	Social	4.56	1.82	4.50	1.89	4.09	1.89	4.45	1.85	1.768	0.155	0.027
	Pleasant	5.13	1.65	5.02	1.95	4.95	1.90	5.02	1.77	0.296	0.828	0.005
	Arousing	4.97	1.57	4.66	1.98	4.77	1.81	4.75	1.81	0.970	0.408	0.015
	Cosy	**5.50^{a}**	**1.77**	**5.17^{a,b}**	**1.90**	**5.16^{a,b}**	**1.90**	**5.00^{b}**	**1.83**	**2.907**	**0.036**	**0.044**

Note. A repeated measure ANOVA was performed with seasons as a within-subject factor. The repeated measured factors include senses such as visual, auditory, tactile, ambience and overall eating evaluation. Values in **bold** indicate a main significant difference. Values within each row not sharing a superscript letter are significantly different (p <.05) as per post hoc multiple pairwise comparisons using Bonferroni-adjusted tests. *Partial* eta squared is the effect size.

with the sensory elements that might be used to describe the overall Norwegian eating experience throughout the year. For example, "warm", "cold", "wind", "snow", "sun", "cosy", "fresh", and "sweet". (See Fig. 5 in the Appendix C)

4.2.2. Study 2B-Colombia

4.2.2.1. The choices of colours across seasons. There was no significant difference in choices of colour among these participants ($p > .05$) except that Opal Blue was the most frequent choices in the Cold season compared to choices in other seasons ($p < .05$). (See Fig. 6)

4.2.2.2. Other sensory elements. Similar to 1B, the results from this study indicated that seasons had almost no impact on the ratings of participants when asking about their eating experiences in Colombia. Table 5 shows that most of these results prompted no significant differences ($p > .05$).

4.2.2.3. Norway vs Colombia. Colombian participants rated the coldness ($M_{diff} = 0.44$, $p < .05$), the humidity ($M_{diff} = 0.87$, $p < .001$), the auditory arousal level ($M_{diff} = 0.86$, $p < .05$), and the arousal level of the overall eating experiences ($M_{diff} = 1.05$, $p < .05$) higher than Norwegian participants. However, compared to Colombian participants, Norwegian

Table 6
Sensory association measures Norway vs. Colombia in Study 2.

Sensory measures		Norway (n = 83)		Colombia (n = 64)		Main effect (n = 147)		
		M	SD	M	SD	M-*diff*	*t*	*p*
Colour	Bright	4.61	0.93	4.50	1.55	0.12	0.526	0.600
	Intensity	4.69	0.92	5.02	1.44	−0.33	−1.591	0.115
Ambiance	Cold	**4.17**	**0.85**	**4.61**	**1.45**	**−0.44**	**−2.159**	**0.033**
	Warm	4.18	0.95	4.22	1.51	−0.04	−0.163	0.871
	Wind	4.52	0.92	4.45	1.20	0.07	0.364	0.716
	Humid	**4.35**	**0.97**	**5.22**	**1.22**	**−0.87**	**−4.672**	**<0.001**
	Sunny	**4.15**	**0.90**	**3.70**	**1.63**	**0.46**	**2.011**	**0.047**
Tactile	Smooth	4.22	0.95	4.56	1.31	−0.34	−1.733	0.086
	Light	4.20	0.77	4.09	1.36	0.11	0.570	0.570
	Curve	4.20	0.76	4.30	1.03	−0.09	−0.600	0.550
	Loose	4.09	0.75	4.04	1.14	0.05	0.292	0.771
	Cold	4.08	0.82	4.23	1.44	−0.15	−0.746	0.458
	Small	3.90	0.88	3.95	1.13	−0.05	−0.279	0.781
	Glossy	4.20	0.82	3.91	1.37	0.29	1.492	0.139
Auditory	Bass	4.30	0.88	4.21	1.22	0.08	0.445	0.657
	Silent	4.27	0.76	4.23	1.42	0.03	0.176	0.861
	Slow	4.55	0.78	4.50	1.37	0.05	0.282	0.778
	Musical	4.26	0.92	4.50	1.49	−0.25	−1.166	0.246
	Pleasant	4.81	0.90	4.90	1.53	−0.09	−0.424	0.673
	Arousing	**3.76**	**1.19**	**4.63**	**1.45**	**−0.86**	**−3.871**	**<0.001**
Overall	Social	**4.92**	**0.99**	**4.40**	**1.51**	**0.51**	**2.364**	**0.020**
	Pleasant	4.97	0.95	5.03	1.57	−0.06	−0.271	0.787
	Arousing	**3.73**	**1.39**	**4.79**	**1.54**	**−1.05**	**−4.276**	**<0.001**
	Cosy	5.26	1.03	5.21	1.64	0.05	0.222	0.825

Note. A *t-independent* sample test was performed with countries (Norway vs. Colombia) as a between-subject factor. Values in **bold** indicate a main significant difference. M-*diff* indicates the mean differences of sensory values between Norway and Colombia.

participants rated higher for the social dimension of their eating experience ($M_{diff} = 0.51$, $p < .05$). (See Table 6).

4.2.2.4. Free association word analysis. As in 2A, Colombian participants were asked to make a list of words that they associated with the typical Colombian eating experience. The association analyses revealed that for each season, participants listed distinctive terms. For example, the words associated with the eating experiences in Humid climate were "heat", "music", "smells", "hot", "food", "sweet", "delicious", and "fresh". "Cosy", "cold", "refreshing", "wind", "dry", "dust", "more", "barbecue", and "boring" were terms connected with the eating experiences in Dry climate. For the Cold season, most related words were "noisy", "nothing", "fruit", "drink", "breeze", "deliciousness", and "salty". The most cited words associated with the Hot season were "soft", "attractive", "water", "humid", "smells", "flavour", and "exciting". (See Fig. 7 in the Appendix C)

The commonality analysis also revealed that several words about sensory elements were used to describe the Colombian eating experiences throughout the year (i.e., "soft", "heat", "music", "smell", "sweet", "food", "bright", and "fresh"). (See Fig. 8 in the Appendix C)

4.3. Discussion

In Study 2A, we found that Norwegian participants associated Summer and Spring as the most social and pleasurable seasons for their eating experiences. The free association task revealed that not only the physical characteristics of the seasons (e.g., climate or light conditions), but also the psychological aspects of seasons (e.g., outdoor activities), influenced how people perceived their eating experiences.

However, we did not find evidence regarding the relationship between Colombia's climates and the sensory aspects of their eating experiences, which is similar to the conclusion reached in Study 1B. These findings may, as a potential explanation, imply that in Colombia, cultural or geographic diversity moderate the impact of the seasons on eating experiences. Again, here it is important to note that seasonal conditions do not vary much over the year in Colombia in comparison to Norway.

When we compared the sensory dimensions of the two countries' participants eating experiences, we discovered that not all aspects of eating experiences differed significantly. In the ambience dimension, Colombian participants rated the coldness of their eating experiences higher than Norwegian participants. As the average temperature in Norway is much lower than in Colombia (Rehdanz & Maddison, 2005), it is possible that Colombian participants are more sensitive to the cold level of the eating experiences compared to Norwegian participants. We also found that Colombian participants provided higher rating for the humidity level. However, Norwegian participants provided higher rating for the sunny aspect of the eating environments. In Norway, people often experience strong contrast in terms of the amount of sunlight received over the course of a year (Haggag et al., 1990), and such striking contrast might become prominent in the memory of Norwegian participants when they tried to recall their eating experience.

5. General discussion

In the present research, we evaluated how different senses are engaged across country-specific eating experiences. We explored the prototypical multisensory eating experience of each country, throughout the seasons.

We frame the present research as an initial step towards the understanding of how people conceptualize multisensory eating experiences associated with their country. In fact, we are aware that food availability often varies with the seasons, but our eating experiences in relation to these variations have not been thoroughly investigated. We argue in this paper that the impact of external factors such as seasonal changes may be due to the associative learning that people accumulate over their lifetime (Mitchell et al., 2009). In that sense, the perception of eating experiences in each season would correspond to the images and feelings that people associate with that season (Gregg & Bower, 1972). For instance, in summer, people might enjoy more energetic music than in winter (Pettijohn et al., 2010). We understand that there are congruences between eating experiences and seasonal changes because our behaviours and perceptions are often consistent with the associative mental images we have in mind, and these mental images influence our

eating experiences through a set of schemata and perceptual responses (Baumgartner et al., 1992; Meyers-Levy & Tybout, 1989).

In particular, the results from Study 1A revealed that the level of sensory engagements within the typical Norwegian eating experience varied across seasons. Xu et al. (2022) found that people in China preferred the landscape most in Autumn and least in Winter. In our research, we found that participants associated the visual aspect of season more positively for Summer and Spring compared to Winter and Autumn in Norway. It could be the case that, when being asked about their visuality of seasons in the food context, people recalled their visual preference not only for the landscape but also with other food related factors such as the diversity of dishes, the social elements of the eating experiences. Especially, Norwegians might spend more time enjoying outdoor activities during Summer and Spring compared to Winter and Autumn. This articulation was supported by what we found in Study 2A in which the list of words participants associated with Summer and Spring in Norway included more words regarding outdoor activities.

Previous research has also found that music choices varied along seasonal changes. For instance, in Australia, people may prefer arousing music during warmer months, more serene tunes during Spring, and melancholy in the cooler months (Krause & North, 2018). Music has also been found to influence for how long people linger in restaurants (Milliman, 1986). Our study complemented the current research with the context of eating experience as we discovered that Norwegian participants associated Spring with more pleasurable sounds than in other seasons.

It is also interesting to document that participants, during Summer, had a stronger aroma association than in Winter. One potential explanation is that the environmental aromas are more prominent in Summer (e.g., grass, flower) compared to Winter, and people often have more chances to be outside and experience these aromas while enjoying their food.

Regarding the overall eating experience, while Winter is often a festive season with Christmas and New Year's dinners, it appeared that it also had the least positive association with eating experiences. Such findings may lead us to the hypothesis that people resemble their eating experiences across seasons holistically, meaning not through a single event, but through a theme or a chain of events.

Seasonal changes do not, however, affect every sense that relates to eating. For instance, in Study 1A, we did not observe a seasonal relationship between the sense of touch and eating experiences.

In Study 1B we were unable to obtain strong evidence on the sensory aspects of eating experiences related to Colombian seasons. It may lead to the assertion that terroirs, country specific factors, influence the gastronomic linkages between the senses and the seasons. In brief, seasons seem to not weight much on the eating experience of Colombians, and this makes sense due to the geographic and climate reality of this country. The mild seasons that Colombians experience can be attributed to the findings that people's behaviour is not significantly affected by the seasons in Colombia, as opposed to Norway. For instance, considering that Colombians have access to a variety of climates throughout the year on the same country's territory, they may be more influenced by the areas (beach vs. mountain; cold vs. hot climate), and context (i.e., working days versus holidays) than seasons *per se*.

In the series of questionnaires using the sensory association measures, we further investigated the connection between the eating experience and the sensory perceptions across seasons. We found that Norwegians associated warmer colours (like yellow and green) with their eating experiences during Summer and Spring, whereas they associated colder colours (like blue and dark blue) with eating experiences during Winter and Autumn. The relationships between seasonal fluctuations and people's sensory interpretations of their eating experiences were once again documented. For instance, in Study 2A, we found that respondents preferred the sounds associated with Summer and Spring to those associated with Winter and Autumn. This finding may be explained by the different dominant auditory environments in the Summer and Spring compared to the Winter and Autumn.

Importantly, in Study 2A we found that participants had specific sensory associations with the eating experience across seasons. For instance, we discovered that participants contrasted their eating experiences from the Summer and Spring to those from the Winter and Autumn as being lighter, curvier, glossier, and looser. As a result, Study 2A strengthens the conclusions we outlined in Study 1A. In fact, Study 2A revealed tactile associations that Study 1A missed, thus, validating the effectiveness of the sensory association instrument.

In Study 2A, participants in Norway were also asked to list the words associated with the eating experiences across seasons. We found that in the Summer and Spring, people associated their eating experiences more with outdoor scenes and activities (e.g., sound of the Ocean, bird tweets), whereas in the Winter and Autumn, the associated words are more linked with indoor activities (e.g., fireplace, candle). This also came along, and may be linked, with the fact that during the colder months, people reported preferring food with strong taste (e.g., salty, sour, powerful) and aromas (e.g., powerful, burnt). In contrast, people mentioned more about berries (e.g., blueberries) and picnic food (e.g., grilled sausages) during the warmer months, and they associated the seasons with more sweet and fruity tastes (e.g., sweet, fresh). These findings provide evidence that the incorporation of seasonal features not only manifests in the sensory aspects of the eating experience but also reflects humans' proclivity to adapt and utilize natural resources that are available during each season. Please refer to Fig. 9, a summary of the most important word associations offered by the participants. In brief, we structured the diagram to show that the five basis senses interrelated and connect with each other, and these connections influence emotions associated with the eating experience. (See Appendix D for word selection procedures and word lists).

Similarly, in Study 2B, we asked Colombian participants to list the words associated with sensory perceptions of eating experiences across local seasons. Analysis of the results indicated that specific physical seasonal elements were commonly associated with the eating experience, yet no clear distinction was observed among the four seasons. For instance, people reported that the environment associated with the Colombian eating experience was colourful and warm in both Hot and Humid seasons. They also reported a cold sensation for both Dry and Cold seasons. Interestingly, when it comes to the gastronomic characteristics of eating experiences, Colombian participants reported that they associated salty and fried food in the Cold season (i.e., energy dense), and sweet beverages such as soda with hotter months. These findings were somewhat consistent with what we discovered in Norway, where most people associated colder months with salty and fattier food (Folwarczny, Otterbring, Sigurdsson, & Gasiorowska, 2022). Here, the results again support the idea that the sensory components of the eating experience not only pertain to the immediate perception of the immediate eating contexts but also mirror the human inclination to adjust to the seasonal variations. (See Fig. 9)

5.1. Theoretical implications

First, our prime contribution to the current literature is by showing that, through the reported associations, not only the immediate factors of the eating environments influence people's eating experiences, but also the non-immediate elements like seasonal/climate changes. Moreover, through the new sensory association measurement, we documented the associations that participants had with each season across the senses. Such associations may form up because of the associative learning process. Future research may examine the strength of these associations and investigate how these associations influence the eating experiences in different contexts across seasons.

Second, the free association word lists demonstrated that people associated both physical and psychological components of seasons with their eating experiences. Therefore, food scientists should delve deeper into the implications of these seasonal characteristics and use them to

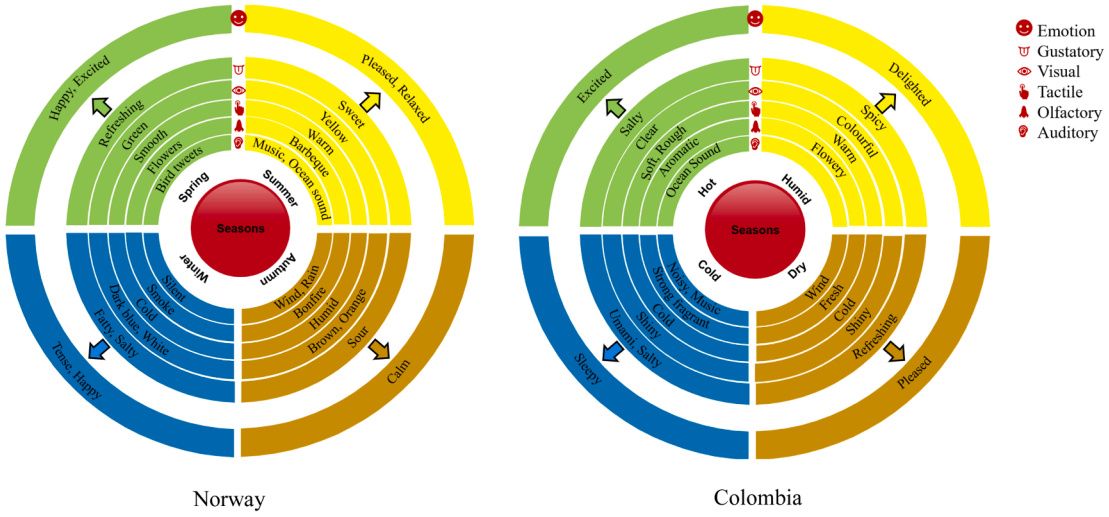

Fig. 9. Summary diagram of words relating to eating experiences in Norway and Colombia.

better understand the eating experiences.

Third, given the fact that we discovered sensory correlations between eating experiences and seasons in Norwegian participants, but not in Colombian ones, we postulate that terroir may partly account for these discrepancies in the findings. While terroir differences have been known to influence product specificities and qualities, influencing local cuisine, the question about how and to what extent these differences interact with seasonal changes and affect the sensory aspects of eating experiences remains unknown. We articulate that there could be other relevant influential factors such as mood changes, seasonal events, and local ritual/cultural activities.

5.2. Practical implications

From a practitioner sight, we suggest food designers and restaurant managers to consider more broadly approaches to enhance customers eating experiences throughout seasons and/or climate conditions. Traditionally, chefs often get inspirations from the seasonal availability to design their seasonal menus. However, restauranteurs can get much more from the seasonal inspirations beyond culinary ideas. For instance, restaurant managers can think of changing the ambience settings of the dining rooms to match with the image people associate with each season, transferring the external environment into the internal dining atmosphere as one of the innovative ways to enhance eating experiences. The fact that dining atmospheres may rely more and more on digital technologies, opens up opportunities for customization of seasonal virtual environments as part of dining settings.

5.3. Limitations and future research

As mentioned, our research is exploratory in nature, which allows us to freely access the eating experiences that participants associate with each season. However, additional research is necessary to take full advantages of what we have discovered. For example, future research may investigate how and when seasons can be used as an advantage to improve eating experiences. One potential question is how to further include the different senses during the eating experiences in each season, so that the experience can be enhanced without overwhelming the diners. Should we create the eating experience in opposition to the seasonal conditions, or should the seasonal conditions be transferred to the eating experience? How can we change the seasonal eating experiences in a way that benefits people in terms of tastes, moods, and health?

Another drawback is that it is difficult to distinguish between the effect driven by pleasure and the effect driven by seasonal characteristics. As a result, it is possible that the association we uncovered was influenced by factors beyond seasons, such as overall positive attitudes toward pleasant climate and positive associations with various activities that occurred during those times, such as sporting events, picnics, and so on. To address that challenge, future research could delve deeper into the specific context of participants' eating experiences, taking into account participants mood, specific time and locations, to further investigate the relationship between seasonality and eating experience.

Furthermore, we encourage future studies with a larger sample size ($n > 200$) and with different participants from other countries to increase the generalizability and enhance the reliability of the findings. To tackle the potential conceptual equivalent issue during the translation process (from English to another language), future research might also employ back translation procedure (Ares, 2018).

Finally, the measures we used in Study 2 are not part of any established scale as these measures, inspired from multisensory studies, were intended to capture the perception of specific sensory characteristics. Therefore, replication research would examine the robustness of the results we discovered.

5.4. Conclusion

In this research, we explored the eating experience associations with seasons through different sensory elements. We found that the seasonal variations constituted parts of the eating experiences, particular for those participants from Norway (versus Colombians). This exploratory assessment revealed not only physical features of seasonal changes, but also their social dimensions, as significantly related to our eating experiences. Finally, we hope that our research can stimulate theoretical debates and potential future research about the role of physical, social, and psychological elements in mediating the relationship between seasonal changes and eating experiences.

Credit authorship contribution statement

Huy Tran: Validation, Writing – review & editing, Writing – original draft, Data curation, Formal analysis, Conceptualization. **Nina Veflen:** Supervision, Validation, Writing – review & editing, Writing – review & editing, Writing – original draft, Data curation, Formal analysis, Conceptualization. **Felipe Reinoso-Carvalho:** Conceptualization, Methodology, Writing - review & editing. **Farhana Tabassum:** Writing – review & editing, Data curation. **Carlos Velasco:** Supervision, Validation, Writing – review & editing, Writing – review & editing, Writing –

original draft, Data curation, Formal analysis, Funding acquisition, Conceptualization.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The authors would like to declare that this research was partly funded by Asahi Breweries Ltd and FoodLessons project- Culinary Heritage as a Resource in Developing "Food Nation Norway 2030".

Data availability

Data will be made available on request.

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Appendices. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodqual.2023.104873.

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