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Similar or different? Comparing food cultures with regard to traditional and modern eating across ten countries

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ABSTRACT

Food cultures can play a role in health and well-being. This raises the questions of whether nation boundaries unite the food cultures of different regions and ethnic groups, what characterises food cultures from very different parts of the world, and what similarities and differences exist. The present study aimed to investigate these questions with regard to eating traditions and modern eating practices. In this cross-sectional study, we recruited 3722 participants from ten countries – Brazil, China, France, Germany, Ghana, India, Japan, Mexico, Turkey, and the USA. Participants represented 25 regional and ethnic groups. They were queried about 86 traditional and modern facets of their food cultures in interviews, paper–pencil and online questionnaires. First, hierarchical cluster analysis suggested nine distinct clusters of food cultures – the food cultures of the Brazilian, Chinese, Ghanaian, Indian, Japanese, Mexican, Turkish, African and Latin US American samples, and of European descendants. Interestingly, for seven of the ten investigated countries, nation boundaries united food cultures. Second, each of the nine food culture clusters was characterised by a unique pattern of traditional and modern eating practices. Third, the nine food culture clusters varied more in their traditional eating practices than their modern eating practices. These results might promote a better understanding of the link between food cultures and health and well-being that goes beyond nutrients. For instance, food cultures might be linked to well-being via strengthening people's sense of cultural identity. Moreover, the present results contribute to a

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better understanding of the complex interplay between food and culture, and could help in developing culturally competent interventions to improve diet and reduce the risk of eating-related diseases.

1. Introduction

Across the world, many different food cultures have been described, such as the Japanese (Freedman, 2016), Turkish (Yilmaz, 2019), and Ghanaian (Albala, 2011) food culture. Food cultures are shaped by resources (e.g., climate and geography), ethnicity, and technology (e.g., food processing and storage, Wahlqvist and Lee, 2007). Importantly, food cultures can play a role in promoting well-being (Loring & Gerlach, 2009), and seem to be linked to health in a variety of ways (Loring & Gerlach, 2009; Rozin et al., 1999; Wahlqvist and Lee, 2007). For instance, the traditional Japanese food culture has been proposed as one factor contributing to the high life expectancy in Japan (Kurotani et al., 2016). The role of food cultures for well-being and health raises the questions of what different food cultures exist, what characterises them, and what similarities and differences exist between them.

Regarding what food cultures exist, an important question is whether nations unite in their food cultures, whether there are differing food cultures within a country, and whether there are even transnational clusters of food cultures. When it comes to food cultures in Europe, Askegaard and Madsen (1998) found that nation and language boundaries had a strong impact on European food cultures. Specifically, different regions within a country largely clustered together, forming a national food culture (Askegaard & Madsen, 1998; see also Minkov & Hofstede, 2012, 2014 for similar results regarding cultural values). However, finding homogenous food cultures within European countries raises the question whether these results are generalizable to larger countries. For instance, the largest country investigated by Askegaard and Madsen (1998) was France, with Brazil, for example, covering an area of 15 times the area of France (United Nations Statistics Division, 2007). In addition, there might be heterogeneity not only in terms of different regions but also with regard to different ethnic groups within one country. For instance, the USA is marked by a plurality of ethnic groups, displaying many different eating traditions (Kittler et al., 2011). Until now, there has been no investigation of whether nation boundaries also unite different regions or ethnic groups within larger countries.

Concerning the question of what characterises different food cultures, there are many different aspects to consider, such as cooking methods and flavour principles (e.g., Long-Solis & Vargas, 2005; Rozin, 1982). As comprehensively considering and comparing the myriad aspects of different food cultures would exceed the scope of a single study, the present study focuses on one aspect – eating traditions in contrast to modern eating practices (Boonkumnerd, 2018; Frez-Munoz et al., 2021; Tellstrom et al., 2005). Importantly, Sproesser et al. (2019) argued that whether something is considered traditional or modern is subject to human evaluation, as 'objective' markers largely do not exist. Moreover, traditional and modern eating seems to be a multi-faceted behaviour, comprising the two major dimensions *what* and *how* people eat, and twelve subdimensions, such as the processing of foods (Sproesser et al., 2019).

There are some studies describing facets that characterise single food cultures (Kanter & Gittelsohn, 2020). For instance, the Japanese food culture has traditionally been characterised by rice-centred meals (Takeda, 2008). In a similar vein, maize and beans have been described as part of the traditional food culture of Mexicans (Long-Solis & Vargas, 2005). The consumption of meat is a firm part of traditional dishes in the food culture of Brazilians (Monteiro & Cannon, 2012), whereas meat consumption rather marks modern eating in the food cultures of the Japanese (Freedman, 2016) or Indians, who have a long tradition of plant-based diets (Agrawal, 2017).

With regard to similarities and differences between food cultures in their eating traditions and modern eating practices, one might speculate that the modern elements of different food cultures are more similar to each other than the traditional elements. Specifically, Popkin et al. (2012) have highlighted that the nutrition transition marks food cultures globally – e.g., through diets high in sugar, oils, and fats (see also Drewnowski & Popkin, 1997). Also, Hawkes (2006) and Melluish (2014) have pointed out that cultures homogenise when moving from their traditions to modern behaviours through the forces of globalization (a 'coca-colonization' or 'McDonaldization', Hawkes, 2006). As far as potential differences are concerned, food cultures might differ both in *what* and *how* people traditionally eat (Sproesser et al., 2019). For instance, similar to differences in meat consumption, the consumption of dairy foods seems to be a discriminating factor – e.g., it is reported as part of traditional eating in the Turkish food culture (Akpinar-Bayizit et al., 2009), whereas it is rather part of modern eating in the food cultures of Japan (Grant, 2014), Ghana (Agble, 2009), and China (Morgan, 2021). With regard to how people eat, the structure of meals might differ between food cultures. For instance, whereas meals traditionally end with a sweet dessert in some countries, such as Turkey (Akpinar-Bayizit et al., 2009), sweet desserts are less traditional in other countries, such as China (Li et al., 2010). However, as there is currently no comprehensive quantitative comparison of different food cultures with regard to traditional and modern eating, little is known about which facets are similar and different.

1.1. The present study

The overarching goal of the present study was to examine food cultures with regard to traditional and modern eating. Specific research questions were 1) whether nation boundaries unite food cultures of different regions and ethnic groups within large countries; 2) which traditional and modern eating facets characterise food cultures from very different parts of the world; and 3) which facets are similar or different. To answer these questions, we selected ten countries. Specifically, to include very different parts of the world, we selected Ghana, Japan, France, Germany, and Turkey. Moreover, to study whether nation boundaries unite food cultures of different ethnic groups, we included the USA and targeted the five largest ethnic groups: African, British, German, Latin, and Italian Americans (United States Census Bureau, 2007). To investigate whether nation boundaries unite food cultures of different regions within large countries, we included China, India, Mexico, and Brazil, each being among the 15 largest countries in the world (United Nations Statistics Division, 2007). In each of these, we selected three to four regions that have been previously described as distinct cuisine areas (Brazil: North, Northeast, South, Southeast, Nascimento et al., 2011; India: North, East, South, West, Sen, 2004; Mexico: North, Centre, Southeast, Long-Solis & Vargas, 2005; China: Sichuan, Guangdong, Jiangsu, Shandong, Zhu et al., 2013). Altogether, this procedure resulted in the investigation of 25 diverse groups (e.g., North Indians, Germans, African US Americans; see Table 1), following the imperative to study both Western and non-Western countries (Henrich et al., 2010; Sulmont-Rossé et al., 2019).

As traditional and modern eating have been shown to be multi-faceted behaviours (Sproesser et al., 2019), the present study used a comprehensive compilation of facets to characterise the food cultures of the different groups. We pursued a quantitative approach, assessing the extent to which the facets are part of traditional or modern eating within the groups. This approach allows for quantitative comparisons between food cultures, in line with approaches from management and psychology that compare cultural dimensions more generally (Hofstede, 1980; Hofstede et al., 2010; Schwartz, 1994, 2014).

Table 1
Description of the sample ($n = 3722$).

	Total *n*	Online *n*	PP *n*	Interview *n*	Female 18–40 years	Female 41–54 years	Female 55+ years	Male 18–40 years	Male 41–54 years	Male 55+ years	*M* BMI	*SD* BMI	*M* Edu	*SD* Edu
DE	215	127	88		55	17	56	33	6	46	24.62	4.12	5.10	2.05
FR	127	62	65		33	0	30	33	0	31	23.94	3.98	4.50	2.10
GH	142	23	57	62	38	3	31	36	2	31	24.33	5.67	3.62	2.46
JP	326	245	81		82	0	91	78	0	75	21.60	3.48	4.56	1.52
TR	127	67	60		39	1	25	27	0	31	25.61	4.79	4.45	2.15
BR-N	122	60	62		34	3	24	33	4	22	26.10	5.09	3.96	1.83
BR-NE	249	183	66		132	4	30	48	3	31	24.74	4.07	4.33	1.97
BR-S	175	90	85		33	4	41	52	12	33	26.22	4.59	4.60	2.18
BR-SE	251	166	85		74	38	41	43	19	35	26.09	4.66	5.43	1.49
CN-G	76	59	17		23	0	17	21	0	15	22.84	5.69	4.77	1.49
CN-J	60	60	0		15	0	15	15	0	15	22.27	3.68	5.13	1.35
CN-Sh	92	62	30		28	0	15	33	0	16	25.25	8.39	5.05	1.39
CN-Si	171	64	107		45	0	45	42	0	39	22.36	5.30	4.06	2.38
IN-N	168	71	97		39	1	40	46	0	39	25.21	4.32	6.04	1.31
IN-E	115	58	57		37	6	14	33	7	18	24.16	4.41	5.53	1.52
IN-S	129	68	61		35	0	30	32	0	31	23.78	4.35	5.63	1.68
IN-W	138	75	63		30	1	34	39	1	32	25.37	5.00	5.44	1.86
MX-N	215	84	131		75	29	33	40	6	31	27.11	5.32	4.90	1.99
MX-C	270	180	90		84	41	53	44	12	35	25.21	3.90	5.74	1.75
MX-SE	193	86	107		68	15	26	44	5	34	26.10	4.75	4.64	2.33
US-Afr	84	64	20		26	1	17	26	0	14	26.29	7.72	4.92	1.55
US-DE	67	65	2		17	1	16	17	0	16	26.81	7.75	4.98	1.38
US-GB	74	68	6		20	0	18	17	0	18	27.25	6.55	5.16	1.62
US-Lat	68	65	3		17	0	10	17	1	23	26.13	8.74	4.85	1.66
US-IT	68	64	4		17	0	24	16	0	11	26.17	5.17	4.84	1.48

Note. DE, Germany; FR, France; GH, Ghana; JP, Japan; TR, Turkey; BR, Brazil; CN, China; IN, India; MX, Mexico; US-Afr, African US-Americans; US-GB, British US-Americans; US-DE, German US-Americans; US-Lat, Latin US-Americans; US-IT, Italian US-Americans; N, North; NE, Northeast; E, East; S, South; SE, Southeast; W, West; C, Centre; G, Guangdong; J, Jiangsu; Sh, Shandong; Si, Sichuan; PP, Paper-pencil; Edu, Education as classified by the International Standard Classification of Education 2011 (OECD, 2015).

2. Material and methods

2.1. Study design

We used a cross-sectional study design with a stratified purposive sampling procedure to ensure that we surveyed people with rich knowledge about the specific food cultures. Specifically, we targeted participants who lived most of their life and childhood within the respective country or region. Moreover, we targeted both men and women as well as younger adults (18–40 years), assuming that younger adults have rich knowledge regarding modern eating practices, and older adults (55 years or older), assuming that they have rich knowledge about traditional eating behaviours. However, if participants between 41 and 54 years took part in the study, they were also included in the analysis. The number of participants in the different age and gender groups is displayed in Table 1. Data collection occurred between November 2017 and November 2018. The STROBE cross-sectional reporting guidelines were used for this manuscript (von Elm et al., 2014).

The ethics boards of the authors' affiliations within each of the ten countries approved the study protocol (e.g., University of Konstanz, Germany). The study conforms to the Declaration of Helsinki. Online participants gave informed consent by ticking a respective box at the beginning of the survey. Interviewed participants and those who filled in the paper–pencil questionnaires gave written informed consent before beginning the study.

2.2. Participants

To ensure the recruitment of a wide variety of different people, we administered the survey both online and paper–pencil-based in every country. As online surveys are rather uncommon in Ghana and self-administered paper–pencil surveys came with difficulties for rural people, we additionally interviewed rural Ghanaians face-to-face, with a trained research assistant reading the questions to participants and noting their responses on the paper–pencil questionnaire. For the interviews and paper–pencil surveys, trained research assistants recruited participants in public libraries, health care institutions, and via visits to houses and workplaces. We recruited online participants (Qualtrics survey software) using the snowball technique, Amazon's Mechanical Turk, and online panel companies. Participants received a small incentive for their participation in accordance with the country's norm. The number of participants that we recruited online, paper–pencil based, and via interviews is displayed in Table 1.

In total, 5986 participants started to answer the survey. Out of these, we excluded 2264 participants because they filled in less than 75% of the survey ($n = 2064$), because they stated that they did not live most of their life and childhood in the respective country or region ($n = 167$), or because they stated they belonged to an ethnic group other than the five targeted ethnic groups within the USA ($n = 33$). The remaining 3722 participants had a mean age of 44.9 years ($SD = 19.3$; range 18–95 years), a mean BMI of 24.9 kg/m^2 ($SD = 5.2$, range 8.1–62.5), a mean education level of 4.9 ($SD = 1.9$; range 0–8) as classified by the International Standard Classification of Education 2011 (OECD, 2015), and comprised of 55% ($n = 2045$) females. Mean BMI and education level split by country, region and ethnic group are displayed in Table 1.

Comparing the study sample ($n = 3722$) with the drop-out sample ($n = 2264$) revealed no significant differences in terms of BMI (24.9 vs. 25.0 kg/m^2, $t(4666) = -0.45$, $p = .656$), education level (4.9 vs. 4.9, $t(5732) = -0.82$, $p = .414$), or gender (55 vs. 54% females, $\chi^2(1) = 0.90$, $p = .344$). However, the study sample was significantly older than the drop-out sample (44.9 vs. 34.4 years, $t(4931.19) = 22.06$, $p < .001$).

2.3. Measures

To capture the aspect of traditional and modern eating regarding food cultures, we developed a questionnaire that assesses 86 facets of traditional and modern eating. These 86 items were based on a comprehensive compilation from previous literature and expert discussions, combining international and interdisciplinary perspectives of what constitutes traditional and modern eating (Sproesser et al., 2019). Items cover both the dimensions *what* and *how* people eat. The 'what' dimension includes six subdimensions – Ingredients, Processing, Preparation, Temporal Origin, Spatial Origin, and Variety – and the 'how' dimension includes six other subdimensions – Temporal Aspects, Spatial Aspects, Social Aspects, Meals, Appreciation, and Concerns. All items and the related subdimensions are displayed in Table 2. Participants were asked to rate to what extent these 86 items are part of traditional or modern eating in their country, region, or ethnic group on a 7-point Likert scale from −3 'very traditional' to 0 'neither traditional nor modern' to 3 'very modern'. To provide participants with some temporal marker, we delivered the instruction that with 'traditional' we were referring to eating behaviour before 1940 (cf., Trichopoulou et al., 2007) and that it might help to think about how their grandparents ate.

We calculated BMI from self-reported height and weight. However, as in a pilot study in Ghana, many biologically implausible values occurred (presumably due to missing knowledge about one's height and weight), a trained research assistant measured participants' height and weight in the interviews and paper–pencil administered questionnaires in Ghana.

We assessed and categorised participants' highest level of education in line with the International Standard Classification of Education 2011 (OECD, 2015), into 0 'Early childhood education', 1 'Primary education', 2 'Lower secondary education', 3 'Upper secondary education', 4 'Post-secondary non-tertiary education', 5 'Short-cycle tertiary education', 6 'Bachelor's or equivalent level', 7 'Master's or equivalent level', 8 'Doctoral or equivalent level'. Participants self-identified their gender and, within the USA, their ethnicity.

We created the survey in English. Bilingual translators translated it into Spanish (Mexico), Portuguese (Brazil), French (France), German (Germany), Twi (Ghana), Turkish (Turkey), Gujarati (West India), Hindi (North India), Bengali (East India), Tamil (South India), Chinese (China), and Japanese (Japan) using the back-translation method (Brislin, 1970). Forward- and back-translators discussed and resolved differences between the original and back-translated version by joint agreement. We piloted the survey in every country and amended it accordingly. In Ghana and India, participants were free to choose whether to fill in the English or local language (Twi, Gujarati, Hindi, Tamil, Bengali) version of the survey.

2.4. Statistical analysis

We conducted statistical analyses using IBM SPSS (Version 25 and 27 for Windows) and Excel 2016. We imputed missing data in the facets of traditional and modern eating using the Expectation Maximization algorithm in SPSS (Gold & Bentler, 2000). Missing values were 5% at a maximum for all imputed variables. To investigate whether nations unite in their food cultures with regard to different regions and ethnic groups, whether there are differing food cultures within a country, or whether there are even transnational clusters of food cultures, we performed a hierarchical cluster analysis with the 25 regional and ethnic groups. We chose average linkage (between-groups) and the Pearson method because it is sensitive to pattern similarities (cf., Minkov & Hofstede, 2012) and may be less sensitive to country-specific survey response styles (Johnson et al., 2011). We based the hierarchical cluster analysis on a 25 × 86 matrix, with the 25 groups (e.g., the German sample) and the mean of each of these on the 86 traditional and modern facets (e.g., how traditional or modern 'eating at home' was rated on average; see Table 2). Given that hierarchical cluster analysis is an exploratory method, deciding on the number of clusters is a function of visual inspection (cf., Saint-Arnaud & Bernard, 2003).

To determine the sample size within the 25 groups, we computed the

Table 2
Aggregated means and standard deviations of the identified nine clusters of food cultures on the 86 traditional and modern eating items ($n = 3722$).

		Brazil		China		EurDesc		Ghana		India		Japan		Mexico		Turkey		US Afr Lat		Aggregated	
No.	Item	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*[a]	*SD*[b]
1	Eating food that has been prepared in grandmother's way (Prep)	-1.76	1.42	-1.27	1.41	-1.93	1.33	-2.44	1.11	-1.77	1.47	-1.07	1.28	-2.12	1.14	-1.85	0.98	-1.33	1.87	-1.73	0.44
2	Only women do the cooking (Prep)	-1.61	1.54	-1.44	1.46	-1.96	1.30	-1.86	1.64	-1.71	1.54	-1.02	1.39	-1.69	1.53	-1.80	1.30	-1.23	1.88	-1.59	0.31
3	Eating dishes that are typical for ... (TO)	-1.83	1.24	-1.20	1.53	-1.40	1.49	-2.20	1.15	-1.18	1.51	-1.41	1.26	-2.03	1.08	-1.55	1.25	-0.48	1.99	-1.48	0.51
4	Eating at home (SA)	-1.74	1.39	-1.01	1.43	-1.66	1.27	-1.85	1.45	-1.66	1.42	-0.78	1.21	-1.88	1.29	-1.66	1.27	-1.02	1.91	-1.47	0.42
5	In a family, everyone eats the main meal at the same time at home (TA)	-1.75	1.42	-0.76	1.60	-1.90	1.26	-1.49	1.73	-1.43	1.51	-1.08	1.44	-1.86	1.30	-1.63	1.24	-1.06	1.95	-1.44	0.40
6	Eating meals cooked or prepared at home (Prep)	-1.69	1.26	-0.93	1.47	-1.39	1.50	-1.93	1.26	-1.55	1.45	-0.69	1.29	-1.80	1.25	-1.46	1.33	-0.73	2.01	-1.35	0.46
7	Eating foods that are produced in the region (SO)	-1.74	1.31	-0.92	1.34	-1.31	1.64	-1.96	1.33	-1.20	1.44	-1.13	1.24	-1.91	1.13	-1.54	1.13	-0.37	1.91	-1.34	0.51
8	Eating basic foods like wheat, corn, or rice (I)	-1.72	1.23	-0.98	1.56	-1.07	1.40	-1.44	1.57	-1.58	1.37	-0.93	1.23	-1.95	1.08	-1.39	1.32	-0.58	1.95	-1.29	0.44
9	Men get preferential treatment over women at mealtimes (Soc)	-1.35	1.62	-0.92	1.68	-1.68	1.49	-1.73	1.68	-1.07	1.68	-1.02	1.45	-1.50	1.57	-1.37	1.51	-0.77	1.99	-1.27	0.34
10	Eating seasonal foods (SO)	-1.54	1.40	-0.73	1.47	-1.40	1.57	-1.11	1.66	-1.20	1.46	-1.30	1.25	-1.82	1.23	-1.31	1.37	-0.08	1.89	-1.17	0.50
11	Eating legumes (e.g., beans, lentils) (I)	-1.67	1.32	-0.49	1.38	-1.11	1.48	-1.35	1.55	-1.20	1.55	-0.61	1.14	-1.94	1.26	-1.63	1.10	-0.44	1.95	-1.16	0.55
12	When eating with other people at home: eating the same foods as the others (Soc)	-1.44	1.48	-0.39	1.46	-1.50	1.39	-1.71	1.56	-1.08	1.52	-0.52	1.35	-1.70	1.34	-1.28	1.46	-0.78	1.73	-1.15	0.49
13	Eating grains (e.g., wheat, rice, corn) and grain products (e.g., bread) (I)	-1.70	1.27	-1.17	1.49	-1.11	1.43	-1.18	1.76	-1.28	1.60	0.37	1.25	-1.85	1.24	-1.55	1.35	-0.72	1.79	-1.13	0.66
14	Eating in a way that shows respect for others at the table (A)	-1.76	1.38	-0.21	1.68	-1.53	1.41	-0.91	2.03	-1.12	1.65	-0.48	1.30	-1.75	1.36	-1.34	1.51	-0.91	1.81	-1.11	0.54
15	Drinking water (I)	-1.67	1.67	-0.73	1.59	-0.82	1.62	-1.42	1.65	-1.27	1.75	-0.48	1.20	-1.27	1.76	-1.19	1.52	-0.34	1.93	-1.02	0.45
16	Eating eggs (I)	-1.76	1.34	-0.38	1.43	-1.17	1.39	-0.85	1.69	-0.82	1.63	-0.34	1.10	-1.90	1.23	-1.46	1.37	-0.50	1.86	-1.02	0.59
17	Eating vegetables (I)	-1.46	1.41	-0.29	1.41	-1.03	1.40	-1.30	1.59	-1.50	1.44	-0.40	1.12	-1.53	1.34	-1.22	1.39	-0.31	1.86	-1.00	0.53
18	Taking time preparing food (Prep)	-1.40	1.53	0.02	1.57	-1.38	1.42	-1.65	1.50	-0.78	1.72	-0.41	1.23	-1.63	1.39	-0.89	1.51	-0.82	1.90	-0.99	0.57
19	Larger family events centre on meals (Soc)	-1.09	1.70	-0.64	1.61	-1.54	1.46	-0.27	2.06	-1.10	1.64	-0.30	1.39	-1.74	1.48	-1.20	1.65	-0.89	1.89	-0.97	0.51
20	Eating at fixed mealtimes (TA)	-1.50	1.50	-0.60	1.59	-1.70	1.33	0.21	2.12	-1.44	1.57	-0.80	1.37	-1.29	1.63	-1.01	1.59	-0.59	2.08	-0.97	0.60
21	Flavouring most of the food in a way that is typical for ... (Prep)	-1.62	1.36	-0.65	1.65	-0.72	1.61	-1.15	1.77	-0.57	1.77	-0.68	1.30	-1.80	1.32	-1.26	1.54	-0.11	1.93	-0.95	0.55
22	Appreciation of food (A)	-1.21	1.56	0.09	1.72	-1.00	1.56	-1.00	1.98	-0.63	1.77	-0.86	1.41	-1.65	1.41	-1.49	1.52	-0.52	1.83	-0.92	0.53
23	Eating fruits (I)	-1.50	1.39	-0.01	1.45	-0.81	1.46	-1.43	1.58	-1.24	1.52	-0.07	1.07	-1.55	1.34	-1.20	1.33	-0.26	1.81	-0.90	0.63
24	Knowing how to cook (Prep)	-0.75	1.83	-0.33	1.38	-1.06	1.45	-1.80	1.55	-0.74	1.79	-0.32	1.11	-1.22	1.67	-1.11	1.39	-0.71	1.87	-0.89	0.46
25	Eating poultry (I)	-1.79	1.19	-0.41	1.39	-0.92	1.45	-0.65	1.78	-0.37	1.71	-0.12	1.18	-1.81	1.23	-1.41	1.21	-0.45	1.92	-0.88	0.64
26	Placing value on table manners (A)	-1.78	1.38	-0.13	1.84	-1.62	1.41	-0.32	2.20	0.14	1.96	0.09	1.43	-1.52	1.58	-1.59	1.48	-0.84	2.00	-0.84	0.80
27	Eating foods made with white flour (I)	-1.56	1.27	-0.89	1.52	-0.56	1.63	-0.32	1.83	-0.56	1.67	0.34	1.23	-1.02	1.57	-1.31	1.38	-0.28	1.83	-0.68	0.58
28	Eating red meat (e.g., pork, beef, lamb) (I)	-1.78	1.31	-0.18	1.42	-1.13	1.47	-0.32	1.94	-0.09	1.79	0.56	1.20	-1.57	1.35	-1.28	1.36	-0.34	1.90	-0.68	0.79
29	Eating fish & seafood (I)	-1.09	1.58	0.20	1.58	-0.45	1.59	-1.41	1.48	-0.51	1.76	-0.71	1.10	-1.12	1.48	-0.58	1.58	-0.27	1.82	-0.66	0.49
30	Taking time when eating (TA)	-1.05	1.63	-0.28	1.51	-1.42	1.42	-0.26	1.89	-0.43	1.65	-0.25	1.26	-1.36	1.49	0.00	1.47	-0.41	1.98	-0.61	0.53
31	Eating industrially unprocessed foods (e.g., fresh vegetables) (Proc)	-0.84	1.77	-0.19	1.56	-0.77	1.83	-1.43	1.68	-0.37	1.78	-0.41	1.46	-1.07	1.74	-0.60	1.81	0.29	1.98	-0.60	0.51
32	Eating with other people (Soc)	-0.81	1.74	0.16	1.29	-1.04	1.52	-1.63	1.62	-0.41	1.70	0.23	1.24	-0.73	1.79	-0.19	1.64	-0.33	1.91	-0.53	0.59
33	Having conversations while eating (Soc)	-0.69	1.80	-0.06	1.44	-0.97	1.52	0.25	2.06	0.04	1.70	-0.01	1.19	-1.33	1.62	-0.32	1.59	-0.54	1.85	-0.40	0.52
34	Eating dairy products (e.g., milk, cheese, yoghurt) (I)	-1.33	1.53	0.99	1.39	-0.95	1.50	1.31	1.64	-0.93	1.71	0.81	1.17	-1.41	1.52	-1.50	1.39	-0.23	1.83	-0.36	1.12
35	Eating home-canned foods (Prep)	-0.95	1.62	-1.42	1.33	-1.16	1.64	1.15	1.70	-0.17	1.85	0.38	1.43	-0.30	1.65	-1.00	1.61	0.40	2.01	-0.34	0.86
36	Major concern is about being able to afford enough food (C)	-0.95	1.73	-0.22	1.55	-0.69	1.55	0.02	2.16	-0.32	1.57	-0.06	1.52	-0.30	1.83	-0.52	1.39	0.10	1.83	-0.33	0.34
37	Buying foods at markets or small family stores (SO)	-0.87	1.66	1.02	1.34	-0.93	1.55	-0.25	1.99	0.34	1.77	-0.38	1.31	-0.84	1.86	-0.92	1.37	-0.03	1.75	-0.32	0.67
38	Foods that are eaten for breakfast differ largely from foods that are eaten for other meals (M)	-1.04	1.68	0.42	1.57	-0.49	1.66	0.91	1.95	-0.28	1.76	0.37	1.22	-0.78	1.73	-1.10	1.59	-0.09	1.80	-0.23	0.70
39	Eating while being served food by others (Soc)	-1.45	1.68	0.20	1.51	-0.38	1.72	0.82	1.92	-0.84	1.65	-0.03	1.22	-0.28	1.84	0.18	1.70	0.10	1.86	-0.19	0.66
40	Eating organic foods (Proc)	-0.26	2.06	0.20	1.76	0.16	1.92	-1.78	1.71	-0.42	1.91	0.13	1.49	0.07	2.00	-0.66	1.92	0.93	1.96	-0.18	0.75
41	Food is seasoned at the table (e.g., with salt, pepper) (Prep)	-0.25	1.79	0.23	1.65	-0.23	1.57	0.15	2.02	0.38	1.78	0.37	1.17	-0.77	1.75	-1.06	1.52	0.23	1.78	-0.10	0.52
42	Eating plant-based foods (I)	0.55	1.83	0.11	1.45	0.81	1.62	-1.23	1.74	-1.01	1.59	-0.10	1.39	0.02	1.86	-0.58	1.64	0.66	1.84	-0.09	0.73
43	Eating grilled foods (Prep)	-0.28	1.70	0.65	1.40	0.19	1.43	-0.87	1.96	0.85	1.68	-0.27	1.18	-0.55	1.67	-0.68	1.44	0.33	1.86	-0.07	0.60
44	Eating a large variety of fruits and vegetables (V)	-0.74	1.75	0.75	1.47	0.19	1.74	-0.12	1.98	-0.58	1.72	0.60	1.31	-0.74	1.69	-0.13	1.76	0.43	1.84	-0.04	0.57
45	Meals end with a sweet dessert (M)	-0.83	1.82	1.06	1.49	-0.61	1.59	1.85	1.37	-0.64	1.77	0.85	1.11	-0.17	1.80	-0.70	1.66	-0.15	1.90	0.07	0.95
46	Major concern is about quality of food (C)	-0.35	1.94	0.75	1.62	0.55	1.74	-0.22	2.11	-0.20	1.91	0.38	1.33	-0.23	1.91	-0.13	1.78	0.31	1.93	0.10	0.40
47	Eating alone at home (Soc)	0.25	1.79	-0.22	1.35	0.67	1.48	0.34	1.99	-0.05	1.62	1.01	1.11	0.31	1.73	-0.11	1.29	0.58	1.66	0.31	0.40
48	Eating deep fried foods (Prep)	-0.33	1.72	0.33	1.44	0.66	1.51	1.37	1.55	-0.17	1.74	0.94	1.20	-0.20	1.79	-0.34	1.42	0.64	1.90	0.32	0.62
49	Eating foods that contain a high amount of oils or fats (I)	-0.17	1.80	0.32	1.40	0.11	1.61	1.73	1.32	-0.22	1.72	1.21	1.17	-0.03	1.86	-0.53	1.36	0.53	1.74	0.33	0.73
50	Eating a large variety of different foods (V)	-0.28	1.71	0.51	1.45	0.90	1.54	0.89	1.74	0.29	1.72	0.65	1.37	0.18	1.72	0.62	1.41	0.89	1.69	0.52	0.40
51	Eating between meals (TA)	-0.05	1.72	0.33	1.37	1.15	1.15	0.85	1.88	0.24	1.53	0.49	1.09	0.45	1.64	0.30	1.34	1.00	1.50	0.53	0.39
52	Eating high sugar foods (e.g., candies) (I)	-0.14	1.79	0.50	1.26	1.00	1.47	1.82	1.38	0.21	1.69	1.22	1.21	0.11	1.86	-0.22	1.36	1.14	1.61	0.63	0.70
53	Food choice based on individual preferences rather than on social norms (Soc)	0.62	1.83	0.49	1.42	1.38	1.41	0.97	1.81	0.55	1.65	1.25	1.28	0.07	1.89	0.03	1.45	0.92	1.75	0.70	0.47
54	Eating an entire meal within 10 minutes or less (TA)	1.01	1.82	0.38	1.39	1.66	1.22	0.11	1.85	0.46	1.61	0.97	1.29	1.00	1.66	0.01	1.62	1.15	1.67	0.75	0.54
55	Skipping meals (TA)	0.84	1.62	0.80	1.39	1.33	1.21	-0.02	1.85	0.70	1.61	1.06	1.22	0.81	1.66	0.32	1.34	1.07	1.60	0.77	0.41
56	Eating foods that contain a high amount of salt (e.g. chips) (I)	0.87	1.83	0.96	1.49	1.01	1.50	0.77	1.75	0.36	1.66	1.44	1.24	0.73	1.71	0.31	1.47	0.61	1.73	0.78	0.35
57	All foodstuff is purchased (as opposed to grown or raised by oneself) (SO)	0.60	1.88	1.09	1.49	1.25	1.59	1.18	1.85	0.56	1.73	0.91	1.40	0.54	1.98	0.46	1.78	0.73	1.82	0.81	0.30
58	Concerns about eating too much (C)	0.56	1.85	0.85	1.50	1.66	1.28	0.32	2.00	0.60	1.71	1.15	1.24	0.87	1.70	0.37	1.69	1.05	1.66	0.82	0.42
59	Food is readily available wherever you are during the day (e.g., when going to work) (SO)	1.13	1.69	0.87	1.42	1.56	1.31	0.92	1.94	0.30	1.67	1.37	1.32	0.46	1.81	-0.05	1.43	0.88	1.82	0.83	0.51
60	Availability of a lot of different ways of cooking or to heat up foods (Prep)	0.81	1.84	0.62	1.55	1.37	1.49	1.37	1.74	0.90	1.78	1.22	1.23	0.36	2.03	0.50	1.81	0.88	1.69	0.89	0.37
61	Doing something else while eating (e.g., watching television) (A)	0.82	1.83	0.59	1.50	1.82	1.14	1.29	1.76	1.04	1.49	1.10	1.21	0.71	1.89	0.37	1.49	1.18	1.64	0.99	0.43
62	Eating alone outside of home (Soc)	1.06	1.69	0.70	1.21	1.45	1.18	1.49	1.44	0.87	1.47	1.15	1.16	1.21	1.53	0.72	1.26	1.23	1.44	1.10	0.29
63	Throwing away food (A)	0.72	1.72	0.80	1.47	1.85	1.24	1.01	1.88	0.96	1.61	1.20	1.42	1.17	1.54	1.22	1.54	1.40	1.58	1.15	0.34
64	Drinking soft drinks (e.g., cola) (Proc)	0.61	1.97	1.47	1.42	1.75	1.22	1.39	1.40	1.16	1.61	1.53	1.21	0.58	1.94	0.67	1.47	1.29	1.65	1.16	0.44
65	Eating while walking/travelling from one place to another (SA)	1.34	1.70	0.67	1.33	1.82	1.26	0.89	1.86	0.93	1.53	1.38	1.27	1.19	1.58	0.87	1.26	1.37	1.53	1.16	0.36
66	Eating while working (SA)	1.31	1.65	0.85	1.39	1.79	1.16	1.15	1.87	1.08	1.47	1.13	1.29	1.25	1.60	0.76	1.30	1.54	1.36	1.21	0.32
67	Eating out of home (SA)	1.18	1.54	0.89	1.21	1.65	1.08	1.68	1.29	1.21	1.37	1.23	1.09	1.29	1.53	1.18	1.22	1.31	1.55	1.29	0.24
68	Eating foods from other countries' cuisines (TO)	0.89	1.62	1.25	1.42	1.47	1.30	1.75	1.22	1.36	1.37	1.44	1.18	1.24	1.38	1.25	1.39	1.12	1.75	1.31	0.24
69	Drinking soft drinks (e.g., cola) during the main meal (M)	0.76	1.97	1.44	1.37	1.88	1.25	2.09	1.17	1.50	1.56	1.74	1.21	0.48	1.97	0.53	1.44	1.40	1.62	1.31	0.59
70	Eating foods that are industrially mass produced (Proc)	1.06	1.68	1.08	1.47	1.90	1.24	1.68	1.52	0.87	1.55	1.72	1.17	1.39	1.55	0.92	1.45	1.37	1.61	1.33	0.38
71	Using plastic utensils (e.g., plastic forks) (A)	0.80	1.76	1.13	1.45	1.90	1.17	1.90	1.34	1.31	1.38	1.25	1.21	1.44	1.52	0.92	1.31	1.37	1.56	1.34	0.38
72	Buying foods in supermarkets or chain stores (SO)	0.37	1.84	1.45	1.28	1.60	1.18	0.87	1.86	1.54	1.41	1.42	1.19	1.34	1.68	1.02	1.64	1.21	1.62	1.35	0.45
73	Eating while being conscious of calorie content or nutritional value (C)	1.16	1.86	1.57	1.57	1.94	1.25	2.03	1.34	1.20	1.72	1.46	1.16	1.34	1.67	1.15	1.51	1.65	1.47	1.35	0.33
74	Eating industrially processed foods (e.g., chips, ready-made meals) (Proc)	1.23	1.70	1.15	1.35	1.90	1.28	1.82	1.35	1.27	1.50	1.75	1.18	1.44	1.55	0.88	1.55	1.47	1.60	1.44	0.34
75	Use of time-saving food preparation equipment such as microwave ovens (Prep)	1.19	1.76	1.33	1.45	1.94	1.16	2.20	1.40	1.37	1.69	1.56	1.16	1.59	1.53	1.46	1.35	1.28	1.65	1.55	0.33
76	Eating ready-to-eat foods (e.g. premade sandwiches) (Prep)	1.28	1.73	1.53	1.37	1.98	1.23	2.00	1.42	1.56	1.49	1.59	1.26	1.30	1.59	1.28	1.47	1.73	1.42	1.58	0.28
77	Eating foods that are imported from all over the world (SO)	1.36	1.64	1.61	1.52	1.85	1.22	1.87	1.45	1.49	1.46	1.90	1.18	1.64	1.37	1.33	1.49	1.37	1.69	1.60	0.23
78	Eating foods that are only recently produced (i.e., new foods that were not eaten previously) (TO)	1.85	1.55	1.56	1.45	1.80	1.37	1.74	1.38	1.26	1.55	1.75	1.26	1.61	1.45	1.56	1.39	1.39	1.64	1.61	0.20
79	Eating pizza (TO)	0.82	1.83	1.80	1.31	1.37	1.34	2.39	1.13	1.84	1.44	1.85	1.21	1.63	1.47	1.34	1.30	1.52	1.61	1.62	0.44
80	Eating at buffet or all-you-can-eat restaurants (SA)	1.28	1.60	1.53	1.32	1.98	1.07	2.08	1.29	1.50	1.36	1.66	1.16	1.65	1.39	1.31	1.40	1.63	1.57	1.63	0.27
81	Eating frozen meals (Proc)	1.43	1.57	1.26	1.38	2.02	1.05	2.04	1.21	1.63	1.50	1.75	1.19	1.78	1.43	1.06	1.54	1.77	1.37	1.64	0.33
82	Consuming artificial sweeteners (e.g., aspartame in diet drinks, to sweeten coffee or tea) (I)	1.24	1.72	1.44	1.40	2.13	1.15	1.87	1.44	1.54	1.53	1.73	1.23	1.79	1.55	1.27	1.38	1.87	1.46	1.65	0.30
83	Consuming diet drinks or foods (I)	1.33	1.67	1.19	1.41	2.06	1.10	1.97	1.32	1.63	1.49	1.95	1.20	1.85	1.46	1.27	1.41	1.68	1.44	1.66	0.33
84	Eating take-away or delivered meals (Prep)	1.44	1.67	1.57	1.47	2.28	1.18	2.08	1.16	1.42	1.45	1.85	1.28	1.64	1.47	1.19	1.37	1.72	1.45	1.69	0.34
85	Eating food from vending machines (e.g. chips) (SO)	1.62	1.66	1.49	1.51	2.23	1.08	2.11	1.26	1.57	1.43	1.79	1.27	1.75	1.46	1.53	1.29	1.77	1.42	1.76	0.25
86	Eating fast food (e.g. hamburgers) (Proc)	1.47	1.66	1.67	1.39	2.26	1.12	2.23	1.14	1.80	1.38	2.07	1.18	1.79	1.41	1.46	1.37	1.83	1.51	1.84	0.30

Note. Traditional items with a mean of −0.5 or lower are shaded in blue; more intense shadings indicate more traditional items. Modern items with a mean of 0.5 or higher are shaded in orange; more intense shadings indicate more modern items. Facets are sorted according to the aggregated mean rating across all clusters from traditional to modern. Information in parentheses after the items relates to the subdimension the item belongs to. TO, Temporal Origin; I, Ingredients; Soc, Social Aspects; SA, Spatial Aspects; TA, Temporal Aspects; SO, Spatial Origin; V, Variability; Proc, Processing; C, Concerns; Prep, Preparation; A, Appreciation; M, Meals; EurDesc, European descendants including France, Germany, and British, German, and Italian US Americans; US Afr Lat, African and Latin Americans. [a] mean of the 9 country means. [b] standard deviation of the 9 cluster means around the aggregated mean.

minimum sample size required to rely on the mean rating of each facet. That is, we calculated the minimum sample size required to test whether the mean rating of a facet significantly deviated from the 'neither nor' response option, and was thus regarded as traditional or modern. A power analysis with $\alpha = 0.05$ and a power of 0.95 revealed a minimum sample size of 54 participants per group to test whether the sample mean deviates from a constant (one sample *t*-test) with a medium effect (G*Power 3.1.9.7; Faul et al., 2007).

Based on the results of the cluster analysis (Fig. 1), we averaged group means and standard deviations across cluster members to build cluster means and standard deviations. These aggregated means and standard deviations are displayed in Table 2. Moreover, Figs. 2-4 visualise the similarities and differences between the nine clusters of food cultures regarding the mean ratings of the 86 traditional and modern eating items, and also include the aggregated mean of the nine cluster means. With a value of −1 meaning 'slightly traditional', we classified items as part of traditional eating behaviour if they had a mean of −0.5 or lower. With a value of 1 meaning 'slightly modern', we classified items as part of modern eating behaviour if they had a mean of 0.5 or higher. If an item's mean was higher than −0.5 and lower than 0.5, we classified the item as neither traditional nor modern, as a value of 0 indicated 'neither nor' (cf., Sproesser et al., 2018). As suggested by Backhaus et al. (2018), we computed *t*-values in a subsequent step for cluster interpretation with $t = (M_{cluster} - M_{overall}) / SD_{overall}$ (see Table S1, Supplementary material). Thus, negative *t*-values indicate that a cluster's mean on a certain variable is lower than the overall mean, and positive *t*-values indicate that a cluster's mean is higher than the overall mean. Focusing on the largest deviations of a cluster from the overall mean, we used *t*-values larger than |0.5| to characterise each of the food culture clusters below.

3. Results

3.1. Do nation boundaries unite food cultures with regard to traditional and modern eating?

The dendrogram of the hierarchical cluster analysis is displayed in Fig. 1. The horizontal axis represents the distance between the groups and clusters. Visual inspection suggested that groups with a mutual distance of a maximum of six points belong to a common cluster. This cut-off resulted in nine clusters of food cultures. Interestingly, the different regions within Brazil, Mexico, India, and China showed relatively small distances and clustered together early in the clustering process. Also, African and Latin US Americans formed a cluster relatively early. Another cluster included the food cultures of the US Americans with European ancestors, and the German and French samples. The samples from Turkey, Ghana, and Japan clustered together with other groups relatively late in the clustering process, and were therefore regarded as distinct food cultures.

3.2. Which traditional and modern eating facets characterise the food cultures of the nine clusters?

To set a baseline for characterising the single food cultures, we examined the overall sample in a first step. Therefore, we inspected the aggregated mean of the nine cluster means (see Table 2, Figs. 2-4). Overall, 32 items were rated as being part of traditional eating and 37 items as being part of modern eating. The three most traditional items

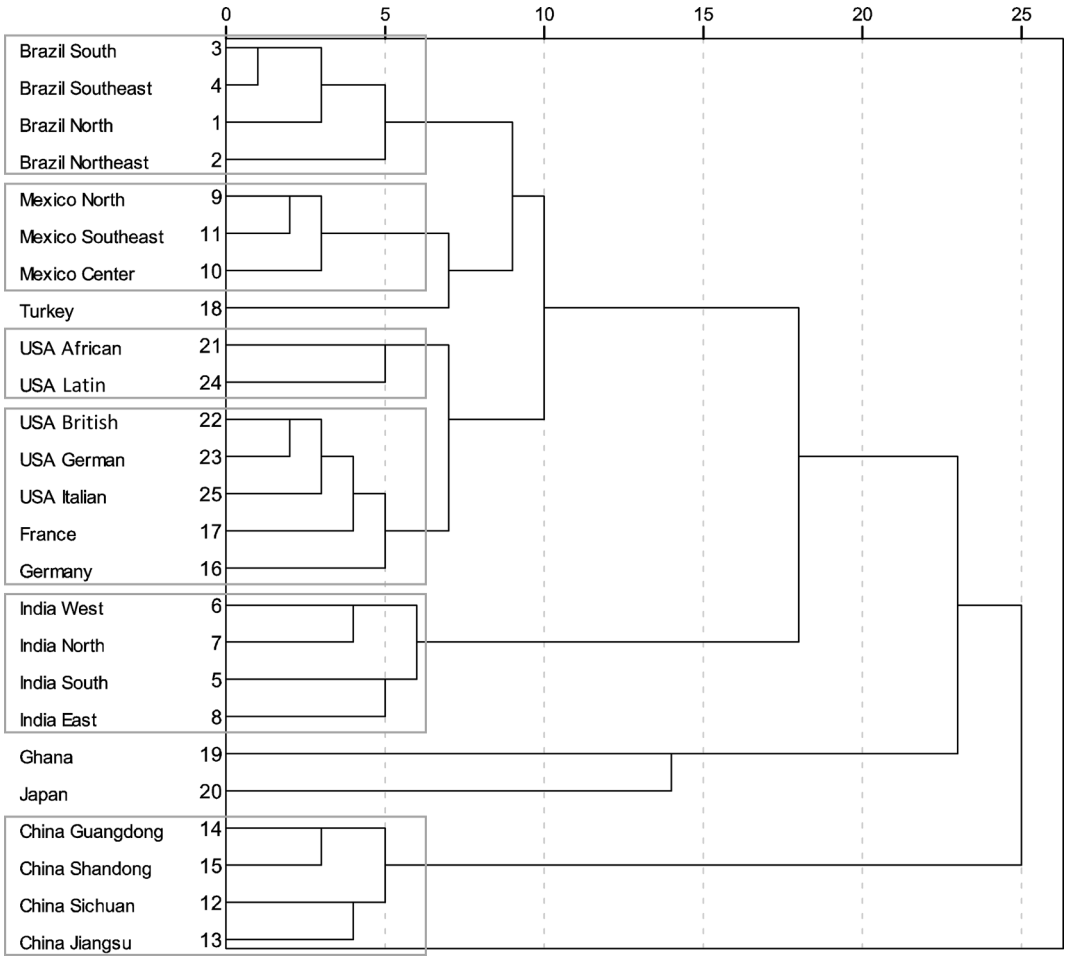

Fig. 1. Dendrogram resulting from the hierarchical cluster analysis of the 25 groups and their mean ratings of the 86 traditional and modern eating items ($n = 3722$).

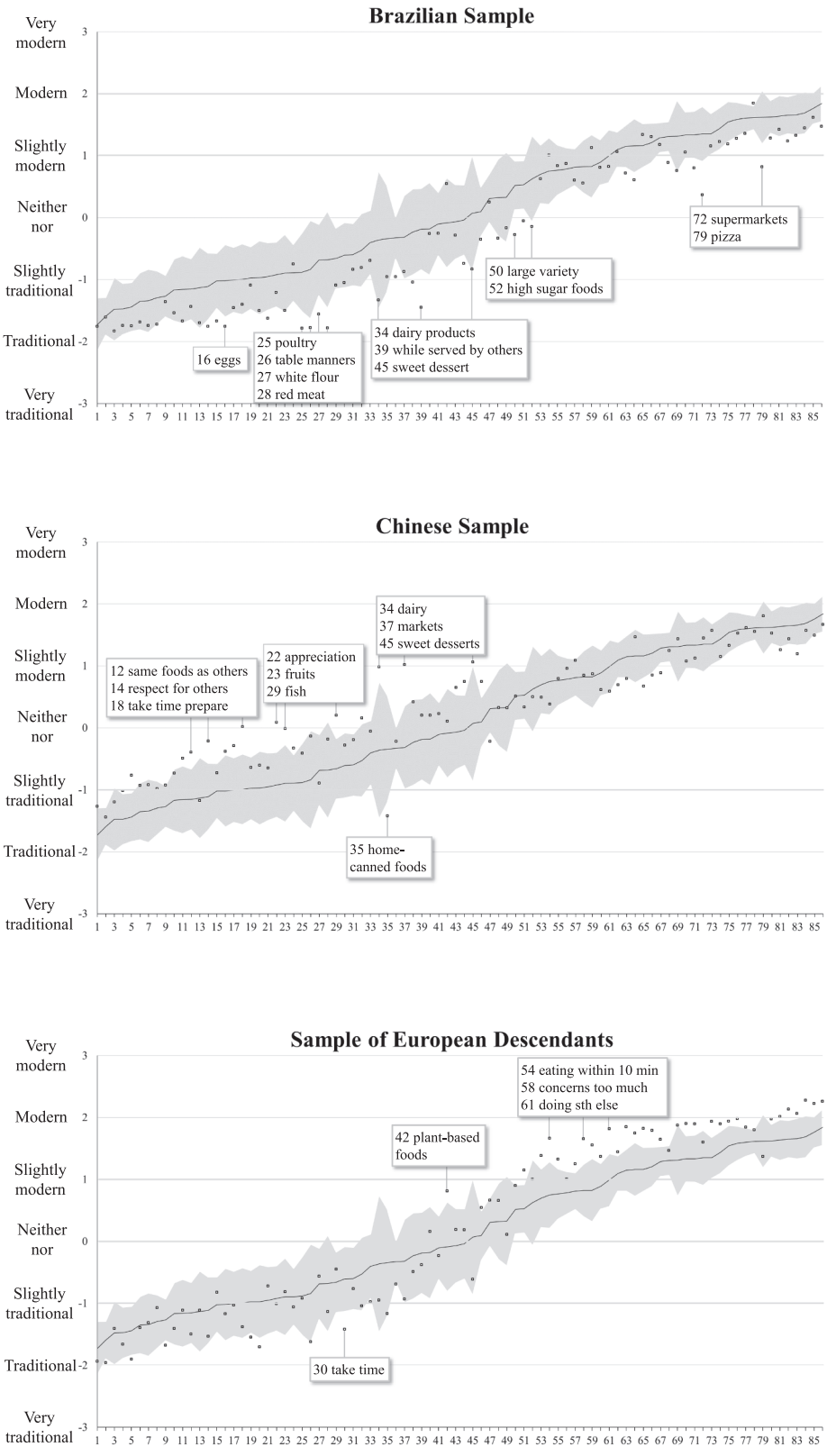

Fig. 2. Characterisation of food cultures for the Brazilian and Chinese sample as well as for the sample of European descendants. Numbers on the x-axis apply to the respective item number displayed in Table 2. Points depict the aggregated means for each of the clusters. The line displays the mean of the nine cluster means and the shading highlights the standard deviation of the nine cluster means around their overall mean (1 *SD* below and above the mean).

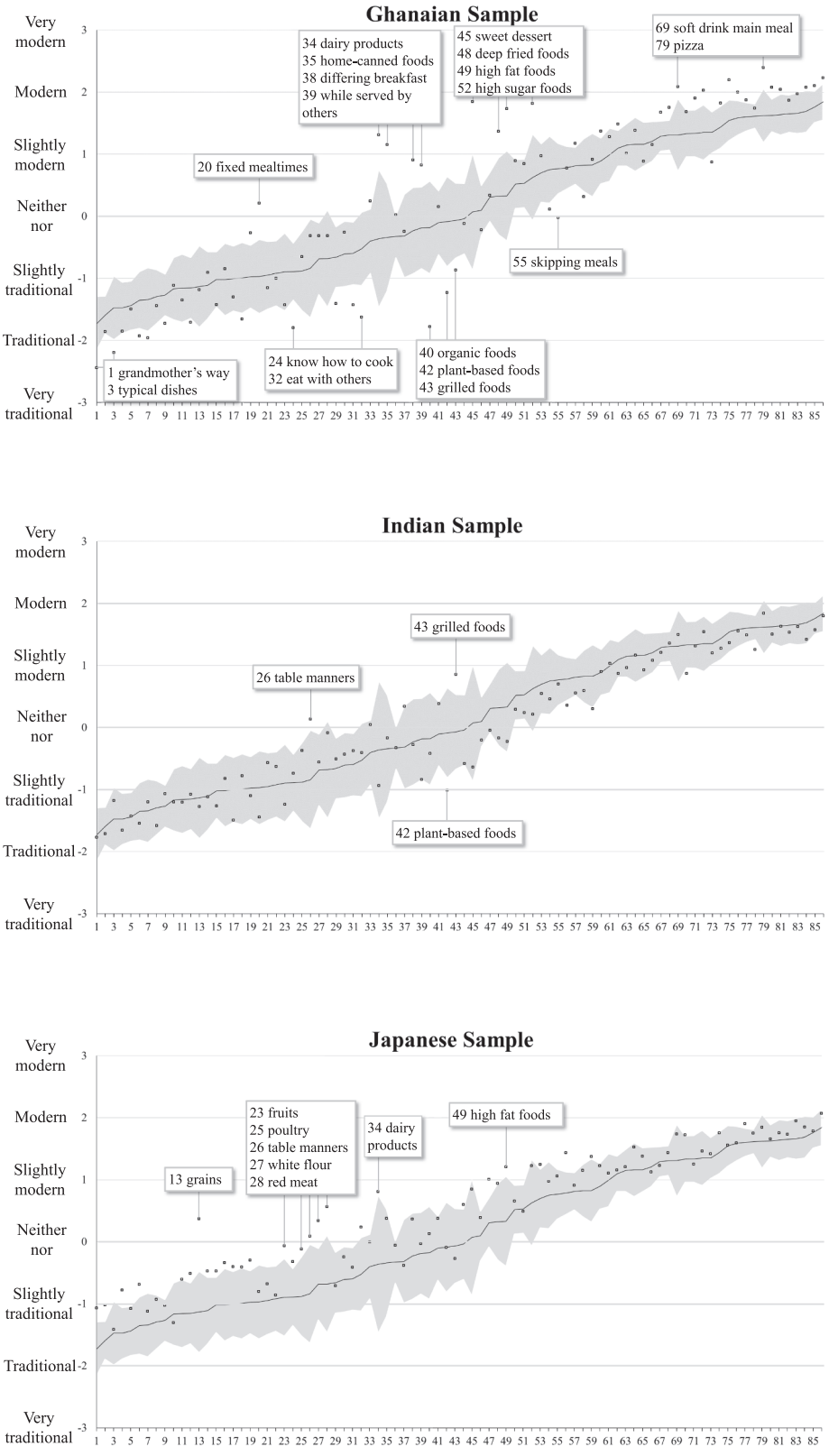

Fig. 3. Characterisation of food cultures for the Ghanaian, Indian, and Japanese sample. Numbers on the x-axis apply to the respective item number displayed in Table 2. Points depict the aggregated means for each of the clusters. The line displays the mean of the nine cluster means and the shading highlights the standard deviation of the nine cluster means around their overall mean (1 *SD* below and above the mean).

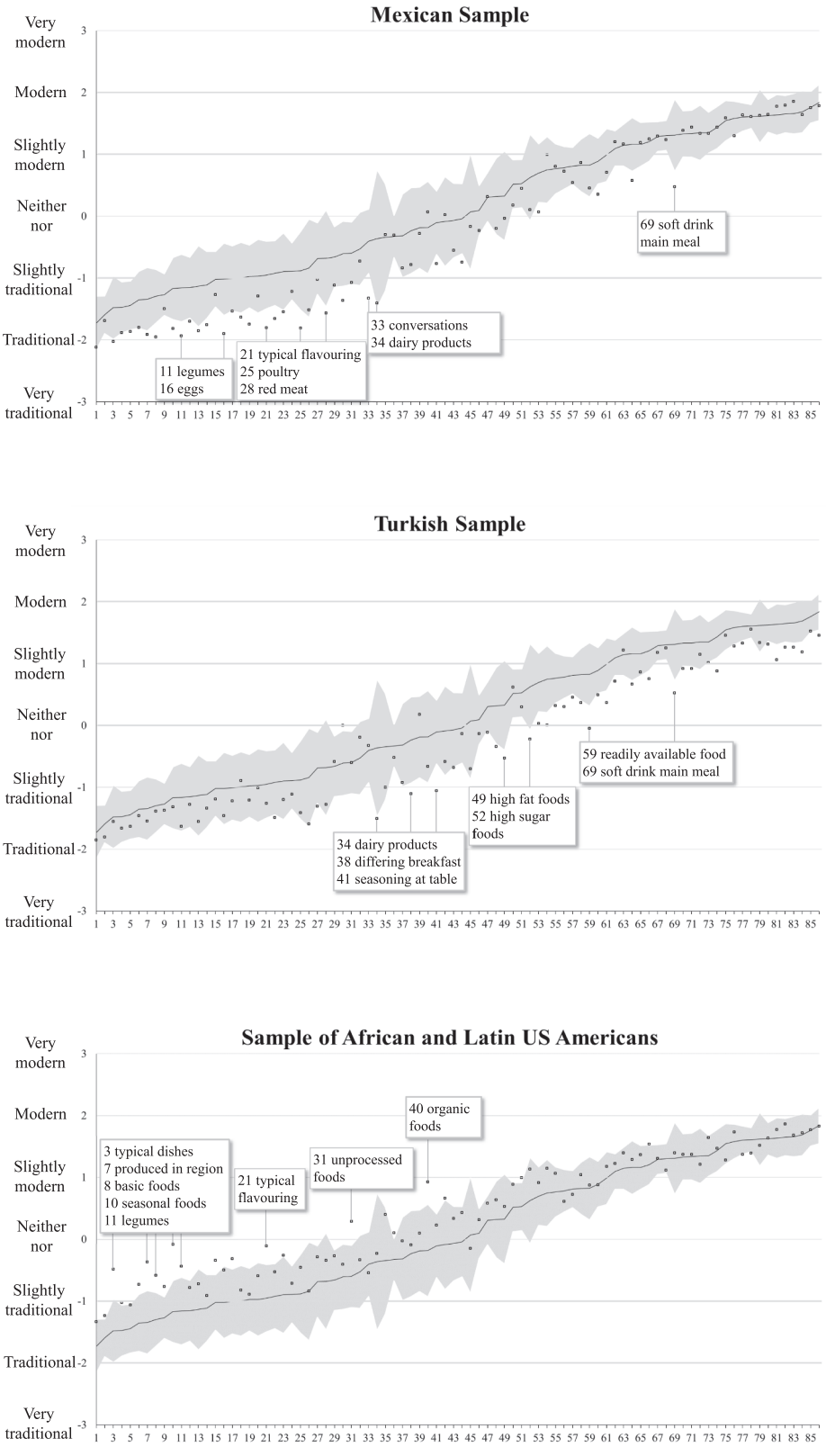

Fig. 4. Characterisation of food cultures for the Mexican and Turkish sample as well as for the sample of African and Latin US Americans. Numbers on the x-axis apply to the respective item number displayed in Table 2. Points depict the aggregated means for each of the clusters. The line displays the mean of the nine cluster means and the shading highlights the standard deviation of the nine cluster means around their overall mean (1 *SD* below and above the mean).

were 'Eating food that has been prepared in grandmother's way', 'Only women do the cooking', and 'Eating dishes that are typical for …'. The three most modern items were 'Eating fast food (e.g. hamburgers)', 'Eating food from vending machines (e.g. chips)', and 'Eating take-away or delivered meals'.

In a next step, deviations of single food cultures from the overall sample were investigated. First, the food culture of the Brazilian sample was characterised by twelve items rated as more traditional ($t < -0.5$) than the overall sample (see Fig. 2, Table S1). The three items that stood out most were (item numbers are displayed in parentheses): eating red meat (28), eating while being served food by others (39), and buying foods in supermarkets or chain stores (72). Second, the food culture of the Chinese sample was characterised by one item rated as more traditional ($t < -0.5$) and nine items as more modern ($t > 0.5$) than the overall sample. The largest discrepancies emerged for the item 'taking time preparing food' (18), which was rated as neither traditional nor modern as opposed to being rather traditional in the overall sample, as well as for the items 'eating dairy products' (34) and 'buying foods at markets or small family stores' (37), which were rated as modern as opposed to being undecided in the overall sample. Third, the sample of European descendants rated one item as more traditional ($t < -0.5$) and four items as more modern ($t > 0.5$) than the overall sample. The three most distinct items were 'eating plant-based foods' (42), 'eating an entire meal within 10 min or less' (54), and 'doing something else while eating' (61); all three being rated more modern than in the overall sample.

Fourth, the food culture of the Ghanaian sample was characterised by eight items rated as more traditional ($t < -0.5$) and eleven items as more modern ($t > 0.5$) than the overall sample (see Fig. 3, Table S1). The largest discrepancies emerged for the items 'eating dairy products' (34), 'home-canned foods' (35), and 'meals end with a sweet dessert' (45), which the Ghanaian sample rated as more modern than the overall sample. Fifth, compared to the overall sample the food culture of the Indian sample was characterised by one item rated as more traditional ($t < -0.5$; 'eating plant-based foods', 42) and two items as more modern ($t > 0.5$; 'placing value on table manners', 26; 'eating grilled foods', 43). Sixth, the food culture of the Japanese sample was characterised by eight items rated as more modern ($t > 0.5$) than the overall sample. Among the largest deviations from the overall sample were the items 'eating grains' (13), 'red meat' (28), and 'dairy products' (34).

Seventh, the food culture of the Mexican sample was characterised by eight items rated as more traditional ($t < -0.5$) than the overall sample (see Fig. 4, Table S1). This was most pronounced for the items 'eating eggs (16), 'poultry' (25), and dairy products (34). Eighth, the food culture of the Turkish sample was characterised by seven items rated as more traditional ($t < -0.5$) than the overall sample. The largest deviations were found for the items 'eating dairy products' (34), 'food that is seasoned at the table' (41), and 'eating high sugar foods' (52). Ninth, the food culture of the African and Latin US Americans was characterised by eight items rated as more modern ($t > 0.5$) than the overall sample. This was most pronounced for the items 'eating dishes that are typical for …' (3), 'foods that are produced in the region' (7), and 'seasonal foods' (10).

Taken together, the Brazilian, Mexican, and Turkish samples were characterised by a number of items being more traditional as compared to the overall sample (i.e., points tend to stick out at the lower part of Figs. 2 and 4). In contrast, the Chinese and Japanese samples as well as African and Latin US American participants stood out due to a number of items being more modern compared to the overall sample (i.e., points tend to stick out at the upper part of Figs. 2-4). Interestingly, the Ghanaian sample was characterised by some items being more traditional and some being more modern than the overall sample. Lastly, the Indian sample and participants with European ancestors displayed a comparably low number of items being more traditional or more modern than the overall sample (showing few points that stick out in Figs. 2 and 3).

3.3. Which facets are similar or different across clusters?

To evaluate which facets were similar or different across clusters, we inspected the standard deviation of the nine cluster means around the aggregated mean (see Table 2 and Figs. 2-4). The standard deviation of the nine cluster means around the aggregated mean is displayed as shaded area around the aggregated mean in Figs. 2-4. The five facets with the largest heterogeneity across clusters were eating dairy products (34), sweet desserts (45), home-canned foods (35), placing value on table manners (26), and eating red meat (28). In contrast, the five facets with the largest homogeneity were eating foods that are only recently produced (78), foods that are imported from all over the world (77), foods from other countries' cuisines (68), eating out of home (67), and eating food from vending machines (85). Interestingly, heterogeneity was larger for traditional eating facets than for modern eating facets, with a correlation of $r = -0.48$ between the aggregated mean and standard deviation of the cluster means around the aggregated mean. Hence, the food cultures of the nine clusters appeared more similar when it comes to modern eating and more diverse with regard to eating traditions.

4. Discussion

The present study revealed the following main findings: First, hierarchical cluster analysis revealed that in seven of the ten investigated countries, nation boundaries united food cultures. Specifically, we found distinct food cultures for the Turkish, Ghanaian, and Japanese samples. Moreover, food cultures of the different regions within Brazil, Mexico, India, and China appeared highly similar and were, thus collapsed within each country. In contrast, ethnic groups within the USA were categorised into two distinct clusters of food cultures, with one cluster including African and Latin US Americans and one cluster including US Americans with European ancestors as well as the French and German samples. Second, each of the nine food culture clusters was characterised by a unique pattern of traditional and modern eating practices. For instance, the food culture described by the Ghanaian sample was characterised by traditionally eating plant-based foods and eating together with other people, whereas dairy products and sweet desserts were part of modern eating behaviour. Third, food culture clusters were comparatively similar in ratings of eating foods that are only recently produced, foods that are imported from all over the world, and foods from other countries' cuisines as part of modern eating. In terms of differences, the largest heterogeneity appeared for the questions of whether eating dairy products, sweet desserts, or home-canned foods reflects eating traditions or modern eating practices. The food culture clusters varied more in their traditional eating practices than in modern eating practices.

With regard to previous results on clusters of food cultures, our finding of national clusters for the Brazilian, Mexican, Chinese, and Indian samples is in line with the results from Askegaard and Madsen (1998), who found that different regions within European countries largely clustered together (see also Minkov & Hofstede, 2012, 2014). In addition, our finding that the Japanese, Ghanaian, and Turkish samples could be considered as distinct food cultures is comparable to results in other domains. Specifically, Ronen and Shenkar (2013) also showed that Brazil, Mexico, China, India, Japan, Turkey, and Ghana were each located in different clusters with regard to work-related attitudes. The found (national) clustering of food cultures does not, however, mean that the combined groups are also similar with regard to other aspects that characterise food cultures, such as regional specialties or cuisines, which have been often documented (e.g., Batu and Batu, 2018; Rozin, 1982; Zhu et al., 2013). Also, in terms of attitudes to food or potion sizes, marked differences have been found between the USA and France (Rozin et al., 1999, 2003, 2011). Instead, our results show that the clusters of food cultures appear similar when it comes to what constitutes traditional and modern eating.

Our finding of a cluster of European descendants as well as a cluster

of African and Latin US Americans deviates, however, from the idea of national food cultures (Askegaard & Madsen, 1998), as well as from research in other domains. One possible explanation for these divergent findings is that the groups that we investigated in the current study are geographically more distant than in the study of Askegaard and Madsen (1998), who investigated European countries. In other words, when performing a more fine-grained comparison among European countries, the differences between the French and German food cultures might appear more pronounced than when a more global comparison is made. That is, when French and German food cultures are compared to a more distant food culture, such as India, the differences between France and Germany might appear relatively small.

With regard to research in other domains, Gupta et al. (2002) found that Germany, France, and the USA were located in distinct cultural clusters when it comes to values and beliefs (see also Ronen & Shenkar, 2013 for similar results concerning work-related attitudes). To explain these diverging results, one might speculate that Germans, the French, and US Americans with European ancestors are more similar regarding their food culture than regarding values, beliefs or work-related attitudes. Specifically, there is evidence that food cultures change comparatively slowly among immigrant groups (Mennell et al., 1992). Moreover, Gupta et al. (2002) as well as Ronen and Shenkar (2013) did not differentiate between different ethnic groups within the USA. Hence, it would be an interesting avenue for future research to study whether different ethnic groups within the USA also build separate clusters in the domains of values, beliefs, and attitudes.

The characterisation of food cultures revealed both results that are consistent with previous research and unexpected results. For instance, in line with our results, low levels of meat (Freedman, 2016) and dairy (Grant, 2014) consumption have been described as part of the traditional Japanese food culture. Also, previous research has indicated that the Ghanaian food culture is characterised by a traditional low dairy intake (Agble, 2009), and an increase in high-fat foods through modern eating practices (Ecker & Fang, 2016). With regard to unexpected results, researchers have claimed that a high consumption of sugar, oils, and fat characterises modern eating (Popkin et al., 2012). However, our Brazilian sample rated high-sugar foods as neither traditional nor modern and our Turkish sample rated foods high in oils and fat as part of the traditional food culture (see Table 2). A potential explanation for this finding is that Brazil was for centuries the world's largest producer of sugar, with table sugar being the cheapest source of calories in the country (Monteiro & Cannon, 2012). Also, Turkey is a homeland of olive oil (Batu and Batu, 2018; Tezcan, 2015), which might account for the perceived traditionality of oils and fat.

Another surprising result was that the Japanese participants rated the consumption of grains as neither traditional nor modern, whereas the Japanese food culture has traditionally been characterised by rice-centred meals (Takeda, 2008). This seemingly contradictory result might be explained by the item wording, including 'bread' as an example of a grain product, with bread being rather modern in the Japanese food culture (Takeda, 2008). Furthermore, our results revealed that eating plant-based foods was considered modern in the food culture of European descendants, whereas eating the same foods as the others at home was rated to be neither traditional nor modern in the Chinese sample, as was skipping meals in the Ghanaian sample (see Table 2). These findings appear to contrast with previous results of expert discussions, which revealed that eating plant-based foods and eating the same foods as the others at home was considered to be part of traditional eating, whereas skipping meals was considered modern (Sproesser et al., 2019). An obvious explanation for these seemingly contradicting results is that Sproesser et al. (2019) compiled facets that can be part of traditional and modern eating, which might be true only in specific food cultures, and our results confirm that all of the investigated facets are part of traditional or modern eating in at least one of the investigated food cultures. The present study takes this further, providing evidence for the notion that whether facets mark traditional or modern eating depends partly on the culture (see also Table 2).

Our results revealed that the nine food cultures were more similar regarding markers of modern eating and more diverse regarding markers of traditional eating. This is not surprising, considering that cultures tend to homogenise when moving from their traditions to modern behavior (Hawkes, 2006; Melluish, 2014). Also, previous research has already suggested that food cultures differ both in *what* and *how* they eat traditionally, such as dairy consumption or whether meals end with a sweet dessert (Akpinar-Bayizit et al., 2009; Grant, 2014; Li et al., 2010). This might raise the question of whether distinct food cultures are expected to disappear sometime in the future, with modernisation inducing homogenisation. We can only speculate here, as more research in the social sciences is needed regarding the change of food cultures, which goes beyond changes associated with the nutrition transition (Fischler, 1990; Popkin et al., 2012). Still, results of Inglehart and Baker (2000) suggest that distinct food cultures will not fully disappear. Specifically, they found that despite massive cultural changes in values between 1981 and 1998, distinct cultural traditions persisted across 38 countries. In any case, our results demonstrate that one traditional set of eating behaviours does not exist, which implies that general statements about the relationship between traditional eating and health are rarely tenable, and must be related to a specific food culture.

The present study reveals several limitations and avenues for future research. Specifically, we did not use probability sampling; thus, our samples might not be representative for the countries on relevant variables. Also, we sampled only four provinces in China, raiding the question of whether our results fully represent the food cultures present in China. Moreover, as with most cross-cultural research, this study faces the challenges of culture-specific survey response styles when comparing means between countries (Johnson et al., 2011). To minimise a potential bias by these response styles, we applied multiple strategies regarding questionnaire design, data collection, and statistical analyses (see Johnson et al., 2011). For instance, a potential bias through cross-cultural differences in acquiescent responding was minimised by avoiding response options like 'agree' or 'yes'. Also, we labelled all response options (e.g., −2 'traditional') to optimise a comparable understanding. Moreover, we used the Pearson method in the cluster analysis, which is robust against level differences, and instead uncovers pattern similarities (cf., Minkov & Hofstede, 2012). Nevertheless, future research is needed to show whether the present findings replicate.

4.1. Implications

How might the results of this study promote a better understanding of the link between food cultures and health and well-being? Given the heterogeneity of eating traditions that characterise food cultures, it is likely that a biomedical approach, focusing solely on nutrients, does not fully explain the interrelations between food cultures and health and well-being. For instance, dairy products have similar nutrient profiles all over the world, but whether they are part of the traditional or modern food culture seems to vary across countries. Loring and Gerlach (2009) have already pointed out the importance of a more integrative approach, seeing food cultures in the light of a biopsychosocial health model (Engel, 1977; Suls & Rothman, 2004). For instance, cultural practices such as ways of eating can be viewed as a behavioural component of cultural identity (Tartakovsky & Abu Kheit, 2017), and several authors have underlined that food and eating are "central to our sense of identity" (Arbit et al., 2017; Fischler, 1988, p. 275). In other words, when people can live out their food cultures, this might strengthen their sense of cultural identity, which, in turn, has been associated with well-being (Usborne & Taylor, 2010). In addition, the present results can help to better understand "the elements of a complex system" (Kanter & Gittelsohn, 2020, p. 481) in order to develop interventions to improve diet and reduce the risk for eating-related diseases, in line with the idea of culturally competent prevention programs (e.g., Inauen & Mosler,

2014).

4.2. Conclusion

The present study compared food cultures with regard to traditional and modern eating across countries, including data from 3722 participants. We surveyed 25 regional and ethnic groups from ten countries with regard to the traditionality or modernity of 86 facets of traditional and modern eating. To ensure the recruitment of a wide variety of different people, we used a stratified purposive sampling procedure as well as performed interviews, paper–pencil, and online data collections. Results revealed nine clusters of food cultures, each characterised by a unique pattern of traditional and modern eating practices. We also found that the food culture clusters varied more in their traditional eating practices than in modern eating practices. Altogether, these results provide rich information about the similarities, differences, and characteristics of food cultures from very different parts of the world with regard to traditional and modern eating practices. This might promote a better understanding of the link between food cultures and well-being that goes beyond nutrients.

CRediT authorship contribution statement

Gudrun Sproesser: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Writing – original draft, Visualization, Project administration, Funding acquisition. **Matthew B. Ruby:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing, Funding acquisition. **Naomi Arbit:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing. **Charity S. Akotia:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing. **Marle dos Santos Alvarenga:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing. **Rachana Bhangaokar:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing. **Isato Furumitsu:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing, Funding acquisition. **Xiaomeng Hu:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing. **Sumio Imada:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing, Funding acquisition. **Gülbanu Kaptan:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing. **Martha Kaufer-Horwitz:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing. **Usha Menon:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing. **Claude Fischler:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing. **Paul Rozin:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing. **Harald T. Schupp:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing, Funding acquisition. **Britta Renner:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing, Funding acquisition.

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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Data availability

Data are available upon request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodres.2022.111106.

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