Appetite 200 (2024) 107535

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

"I find it hard to change poor food habits": Measuring food choice motives in an emerging economy

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ARTICLE INFO

Keywords:
Food choice drivers
Food choice motives
Emerging economy
Questionnaire development
Low-middle income country

ABSTRACT

Food choices are driven by an array of motives that have been approached, determined and quantified in a number of ways, mainly in developed countries. The objective of this study was to better understand the motives behind food choices in an emerging economy by collecting information from urban people in South Africa in a series of four studies. (1) Items generated through focus group discussions with low, middle and high income participants by Magano et al. (2023) were checked for content and face validity and (2) 123 statements derived from them were evaluated by 621 respondents. After exploratory factor analysis (EFA), 46 statements best representing the motivational space were (3) presented to another group of respondents (n = 259). Here, the EFA resulted in a 31-item, 7-factor food choice questionnaire for emerging economies (FCQ-EE) which was (4) confirmed by a nationwide sample (n = 814) and further refined to an alternative 19-item, 7-factor solution. The emerging factors were: Healthy eating constraints (HEC), Frugality (FR), Emotional eating (EE), Meat appeal (MA), Weather (WE), Quality seeking (QS) and Cooking constraints (CC). Whether used in the 31-item or 19-item format, this set of statements highlights factors underlying food choice in an emerging economy and offers a way to study their importance in similar contexts. Further research is needed to show the extent to which these factors can predict actual food choices.

1. Introduction

Food choice motives are vast and complex and the accumulation of food choices made daily give an overview of a person's diet. Given the important implication of people's diets on public health outcomes, researchers have approached, determined and quantified food choice motives in a number of ways. For example, the Food Preoccupation questionnaire by Tapper and Pothos (2010) was developed to measure the extent to which people in Wales are focused on food and eating. The Meaning of Food in Life questionnaire (MFLQ) was developed in the USA by Arbit et al. (2017) to systematically measure the meaning of food in one's life and how it pertains to food choice. The Eating Motivation Scale (TEMS) by Renner et al. (2012) determines the motivation of eating behaviour and was developed with respondents in Germany. Earlier instruments, such as the Health and Taste Attitudes Scales (HTAS), has been shown to measure the impact of health and taste predispositions in three European countries (Roininen et al., 2001); and Pliner and Hobden (1992) developed the Food Neophobia Scale (FNS) amongst Canadians to measure the propensity to avoid or to try novel foods. Our group (De Kock et al., 2022) has recently updated this FNS instrument to better capture this widely recognised trait that predicts human food choice.

One of the most popular questionnaires to measure food choice is by Steptoe et al. (1995), who sought to comprehensively measure the importance of food choice determinants, from health to mood and environmental awareness. This 36-item Food Choice Questionnaire (FCQ), developed in the UK, has since been widely used to predict aspects like product acceptance (Ares & Gámbaro, 2007), to investigate the associations between food choice and food neophobia (Jaeger et al., 2021), to predict people's inclination to vegetarianism (Dorard & Mathieu, 2021) or their propensity to eat sweet foods (Mielmann & Brunner, 2020). Food choice determinants of people in emerging economies like South Africa, where a large percentage of the population live below the national poverty line (Kirsten et al., 2023; Lappeman et al., 2021), may not be fully captured by instruments such as the Steptoe FCQ (Steptoe et al., 1995) constructed in the perspective of

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https://doi.org/10.1016/j.appet.2024.107535
Received 26 November 2023; Received in revised form 8 May 2024; Accepted 28 May 2024
Available online 29 May 2024

developed countries. Also, many of the instruments were developed some 30 years ago and thus need to be revisited considering the dynamics of food choice drivers over time. Recent food choice drivers, such as those influenced by the plant-based movement (Nguyen et al., 2020; Rosenfeld & Burrow, 2017) and those relevant to emerging economies, like nutrition and food insecurity considerations (Oldewage-Theron et al., 2006) are not necessarily represented. For example, in measuring the food choice determinants of people in Malawi using the Steptoe FCQ, Gama et al. (2018) recommended that the perceived satiety of foods should be included as a measured statement, as 77% of their participants (a representative sample of n = 489) indicated that the prospect of food being "filling" was an important driver of choice.

Approximately 25% of people living in South Africa experience food poverty, as they lack access to sufficient food of adequate quality (Sulla, 2020) - thus making, for many, a healthy diet hard to attain. Furthermore, despite the food-based dietary guidelines of South Africa which encourage people to, for example, use fats, salt and high sugar foodstuffs sparingly (Vorster et al., 2013), non-communicable diseases driven by diet (e.g.,: hypertension and type 2 diabetes) and lifestyle are among the leading causes of death (Bradshaw et al., 2010). Some reported constraints to healthy eating were affordability, preferences for unhealthy food, mood and longstanding unhealthy food habits (Magano et al., 2023; Voorend et al., 2013), however, the extent to which these and other factors play a role in various populations needs to be measured. Studying food choice determinants is therefore crucial to planning effective nutrition education interventions to improve public health (Gichohi-Wainaina et al., 2023). Understanding drivers of food choice is also essential when developing new food products to address malnutrition.

The objective of this study was to quantitatively determine the food choice motives of urban people in South Africa. This is a continuation from an earlier study (Magano et al., 2023), which qualitatively identified food choice drivers amongst low-, middle- and high-income people living in urban South Africa. The food choice items elicited in this study may be useful for measuring food choice drivers and relating them to sociodemographic aspects in various cultures and contexts with similar economies for the improvement of public health outcomes.

2. Overview of study method

The research, leading up to two sets of items (longer and shorter) that describe the food choice motivation, entailed four stages. In stage 1, the initial pool of food choice items was identified and screened for further use. This was followed by stage 2, where the dimensions emerged from factor analysis of ratings of the food choice items. The resulting factor structure was tested further with another group of participants in stage 3. The factorial structure and final sets of items were confirmed in stage 4.

The purpose of each stage, recruitment and demographic information of the participants are summarised in Table 1. The participants of stages 1 and 4 were more diverse in terms of education level and age, whereas those of stages 2 and 3 were mostly a convenient sample of young and educated people (the future decision makers).

Approval for the study was granted by the University of Pretoria's Faculty of Natural and Agricultural Sciences' ethics committee (reference number NAS131/2021). Respondents of all research stages gave their consent to participate.

3. Stage 1: selection of food choice items

3.1. Methods

Items (k = 431) were generated through focus group discussions with low, middle and high income urban people (n = 75). The procedure has been described elsewhere (Magano et al., 2023). The refinement process entailed removing items (Dickson-Spillmann et al., 2011; Renner et al.,

Table 1
Overview and demographics of the participants in stages 1–4.

	Stage 1 (n = 75)	Stage 2 (n = 621)	Stage 3 (n = 259)	Stage 4 (n = 814)
Purpose of each stage	To identify and screen the initial pool of items that describe the typical drivers of food choice.	To identify factors emerging from the initial pool and to eliminate items not meeting the statistical criteria.	To identify the most salient items and factors emerging from them using a different population.	To confirm the emergent factors and structure of the food choice model on a wider population.
Recruitment	Described in Magano et al. (2023)	From a database of consumers at the University of Pretoria		From a national consumer database of a marketing agency
Demographic information	%	%	%	%
Years of education				
13+ (Post-high school)	53	71	81	43
8 to 12 (High school)	41	29	18	56
1 to 7 (Primary school)	6	0	1	1
Gender				
Women	79	75	74	69
Men	21	23	25	31
Other	0	2	1	0
Age (years)				
18 to 35	57	92	91	42
36 to 45	19	3	5	29
46 to 65	24	5	4	21
65+	0	0	0	8
Race				
Black	100	Not determined		58
Coloured[a]	0			12
Indian	0			6
White	0			23
Other	0			1
Employment				
Student	1	Not determined		8
Full-time employed	64			37
Part-time employed (not a student)	4			9
Self-employed	7			13
Unemployed	21			25
Stay-at-home parent/ Home executive/ Not looking for work	3			9
Monthly household income[b]				
Less than R 3500 (poor)	24	Not determined		18
R 3500 to 8000 (working poor)	17			23
R 8001 to R 22,000 (working class)	11			30
R 22,001 to R 40,000 (middle class)	13			12

(continued on next page)

Table 1 (*continued*)

	Stage 1 (n = 75)	Stage 2 (n = 621)	Stage 3 (n = 259)	Stage 4 (n = 814)
Purpose of each stage	To identify and screen the initial pool of items that describe the typical drivers of food choice.	To identify factors emerging from the initial pool and to eliminate items not meeting the statistical criteria.	To identify the most salient items and factors emerging from them using a different population.	To confirm the emergent factors and structure of the food choice model on a wider population.
Recruitment	Described in Magano et al. (2023)	From a database of consumers at the University of Pretoria		From a national consumer database of a marketing agency
Demographic information	%	%	%	%
R 40,001 to R 75,000 (upper middle class)	8			6
More than R 75,000 (top end)	15			4
I prefer not to answer	12			7

[a] Term used for persons unable to fit into definitions of White or Black, including those with mixed-race and for e.g. Cape Malays, Namas, Koranas, and Griquas (Pirtle, 2023).

[b] Income ranges determined by Lappeman et al. (2021), where $1 equated to about R18.41 in 2023.

2012; Taherdoost, 2016a):

1. That were redundant, i.e. having the same meaning but worded differently (k = 121)
2. That were weakly linked to or did not inform food choice directly e.g. "Traditional food is nostalgic" (k = 69)
3. That were gender specific e.g., "I am inclined to eat/crave certain food during my menstrual cycle" (k = 1), to ensure inclusivity for all genders

This process resulted in k = 240 items which were then evaluated for content and face validity by four individuals (including N·N.D.) with knowledge and experience in the area of consumer food choice. The evaluators indicated the items deemed as typically important food choice drivers for people in the context of an urban and emerging economy.

Lawshe's method was applied to screen the items by the content validity ratio (CVR) (Boateng et al., 2018; Taherdoost, 2016b). Based on the number of evaluators, a CVR of 0.99, as determined by Taherdoost (2016b) was applied; meaning all four evaluators had to agree for an item to be included. This refining process yielded n = 110 items which were used in the next phase of pre-testing.

The items were phrased such that each of them could be rated on a seven-point Likert scale from 1 (strongly disagree) to 7 (strongly agree), with the middle point representing neutrality (neither agree nor disagree) in a structured questionnaire. To check the accessibility of the questionnaire, it was completed by 26 respondents with no background of the study. The respondents could select the "I do not understand this statement" option if it was not clear to them. They were also given an opportunity to explain why they did not understand a statement. The questionnaire was reviewed by the research team (all authors of this paper) for clarity and conciseness of the items (Boateng et al., 2018). Some items from the initial list of 240 items were retrieved. This was based on the importance of these items in food choice research reported in other emerging economies e.g., Malawi (Gama et al., 2018) as well as field research conducted in Botswana and Lesotho (Unpublished workshop reports by Tuorila, De Kock, Kobue-Lekalake & Nkhabutlane 2022). Overall, 9 items were amended and 13 were retrieved, thereby yielding k = 123 items (Supplementary Table S1).

The 123 items were sorted into categories established in the preceding study (Magano et al., 2023). That study had 17 categories, however, no items related to "Natural content" remained due to the item refinement process described above. Thus, 16 categories remained. Where it made grammatical and logical sense, items were reworded so that some would be negative or contrary in position to their respective categories. This was done to minimise response bias (Sauro & Lewis, 2011) and to keep the respondents engaged in the questionnaire. As a result, 48 of the 123 items were worded negatively. The list of items was checked again by the research team and no further amendments were made at this stage.

3.2. Results

The 123 food choice items listed according to 16 categories, each represented by 2–23 items, are shown in Supplementary Table S2. The order of the categories follows from most to least proritised by low income participants as described by Magano et al. (2023).

4. Stage 2: Establishing the factors and item reduction

4.1. Methods

4.1.1. Questionnaire administration

To minimise measurement errors and ensure some representation of a larger population, it is recommended to include at least five to 10 responses per item (Boateng et al., 2018; Carpenter, 2018; Costello & Osborne, 2005; Uz Zaman et al., 2020). Therefore, n = 5405 people were invited by email to rate, on a Likert scale from 1 (strongly disagree) to 7 (strongly agree): 1) the k = 123 items presented in random order, 2) complete the 9 question Household Food Insecurity Access Scale (HFIAS) (Coates et al., 2007) and 3) provide demographic information about: age (year of birth), gender (man, woman, other or prefer not to say) and years of education attained (primary school, high school or post-high school education). The respondents were individuals who voluntarily signed up to a consumer database of the University of Pretoria to receive invitations to participate in product research studies.

The HFIAS determined whether respondents from various socio-economic groups were represented. The questions asked about the occurrence of food insecurity they could recall in the past four weeks, respondents could answer yes or no and were prompted to indicate how often it happened (1 rarely, to 3 often) when answering yes. Based on the tallying system described in Coates et al. (2007), the respondents could be distinguished as either food secure or mildly, moderately or severely food insecure. It was postulated that respondents categorised as mildly, moderately or severely food insecure were likely from a low income background.

4.1.2. Statistical analysis

The food choice items worded negatively towards a category (e.g., HEC) were reverse coded. All respondents with incomplete responses were excluded (348 of 1036 cases) before exploratory factor analysis (EFA) was conducted using R (version 4.2.1). EFA was done using principal axis factoring and the direct oblimin rotation. Furthermore, to eliminate noise from the data, cases where respondents slightly agreed (5) to strongly agreed (7) to two contrasting items ("I consider losing weight when making food choices" and "I choose food that will help me gain weight") were removed (67 of 1036 cases). EFA was conducted after: sampling adequacy was determined using the Kaiser-Meyer-Olkin

(KMO) measure, factorability was measured using Bartlett's test of Sphericity and the determinant of the correlation matrix was calculated. Only factors with Eigen values > 1 were retained. The criteria for each iteration were as follows (Osborne & Costello, 2004; Schreiber, 2021; Uz Zaman et al., 2020):

1) Remove items with a communality value of <0.25 and items with a loading of >0.32 in more than one factor (cross-loading)
2) Determine the Cronbach-alpha-if-deleted for each item within a factor and remove items that negatively affected the Cronbach alpha.

To explore possible factor structures, two methods of item reduction were applied, whereby the order of the iteration was changed; method A (application of criteria 1 then 2) and method B (application of criteria 2 then 1).

4.2. Results

In total, the responses of n = 621 were analysed (see Table 1). Most of the respondents were women (76%), between the ages of 18 and 35 y (92%) and with post-high school education (71%). The majority (73%) of the respondents were either mildly (15%), moderately (27%) or severely (31%) food insecure with only 27% being food secure.

Two different factor structures emerged as a result of applying reduction methods A or B (Table 2). Method A yielded a nine factor, 41 item solution and method B resulted in a seven factor, 25 item solution. The iteration process involved the combined removal of 77 items which did not adhere to the aforementioned communality and cross-loading inclusion criteria. The sample was adequate for factor analyses using both methods A and B with KMO values of 0.81 and 0.78, respectively and significant Bartlett's test of sphericity outcomes ($p < 0.001$). Cronbach alphas ranged between 0.40 and 0.77 and the variance explained by both solutions was 41% (Table 2). The process yielded a solution consisting of 46 items combined.

5. Stage 3: Testing of the 46-item solution and further item reduction

5.1. Methods

A questionnaire with 46 items from the seven and nine factor solutions was constructed (Table 2). Three of the items (indicated in Table 3) were reworded for increased clarity.

5.1.1. Questionnaire administration

The questionnaire was administered to people who signed up to the University of Pretoria consumer database, however, only to those who did not participate in stage 2. Taking into account the subject to item ratio requirement of >5:1, at least 230 (5 × 46 items) responses were required (Carpenter, 2018; Costello & Osborne, 2005; Uz Zaman et al., 2020). The items (n = 46) were rated on the Likert scale (1 - strongly disagree to 7 - strongly agree, with a neutral point, neither agree nor disagree) and similarly to stage 2, questions about age, gender and education level were asked at the end.

5.1.2. Statistical analysis

The items worded negative to their factor were reverse coded, then EFA was conducted by applying the same factorability and item retention parameters described in stage 2 using R (version 4.2.1).

5.2. Results

A total of 259 complete responses were obtained (Table 1). Most respondents were: women (74%), between ages 18 and 35 y (91%) and with post high-school education (81%).

The sample was adequate for factor analysis with a KMO value of

Table 2
Factor loadings, communalities and Cronbach alpha's of the seven and nine factor solutions obtained from EFA of 123 food choice items evaluated by n = 621 respondents (stage 2).

Items (n = 46 items)	Factor loadings		Communalities		Cronbach alpha	
	7 factor	9 factor	7 factor	9 factor	7 factor	9 factor
Price & availability of resources					0.77	0.76
I always look for cheaper food options[a]	0.58	0.58	0.51	0.56		
I usually compare prices of food brands[a]	0.69	0.68	0.49	0.49		
I don't check what food is on sale or special (R)[a]	0.62	0.61	0.39	0.38		
I want as much food as possible for as little money as possible[a]	0.38	0.4	0.27	0.31		
I shop around to get the cheapest price or best deal[a]	0.7	0.66	0.49	0.43		
I don't check prices before going to buy food (R)[a]	0.55	0.57	0.35	0.37		
There are many food products that I can't afford[c]		−0.34		0.3		
I have no choice but to eat what is available to me[c]		−0.3		0.4		
Emotional eating					0.76	0.77
I never give in to my food cravings (R)[a]	0.51	0.43	0.32	0.35		
I eat junk food when I'm stressed[a]	0.73	0.76	0.55	0.62		
I crave sweet or fatty food when moody[a]	0.72	0.73	0.5	0.51		
My moods and emotions don't dictate what I eat (R)[a]	0.59	0.62	0.42	0.42		
I eat when I'm bored[a]	0.54	0.43	0.36	0.34		
Meat appeal					0.73	0.73
Eating meat is not important for my health (R)[a]	0.53	0.57	0.28	0.34		
I have to eat meat at least once a day[a]	0.67	0.65	0.43	0.45		
I choose not to eat meat (R)[a]	0.61	0.66	0.38	0.48		
I'd rather buy cheap meat than no meat at all[a]	0.46	0.4	0.33	0.32		
Food with no meat is incomplete[a]	0.71	0.61	0.55	0.5		
I prefer protein foods that are not from animals (R)[c]		−0.55		0.38		
Convenience and taste					0.77	0.62
I value taste more than health[a]	0.35	0.64	0.31	0.49		
Convenience food makes my life easier[b]	0.54		0.33			
I prefer convenience food if I can afford it[b]	0.69		0.49			
I eat fast food on most days[a]	0.43	0.31	0.30	0.25		
Weather					0.62	0.77
I want to eat certain food when the weather is cold[a]	0.9	0.81	0.81	0.69		

(continued on next page)

Table 2 (*continued*)

Items (n = 46 items)	Factor loadings		Communalities		Cronbach alpha	
I want to eat certain food when the weather is warm[a]	0.67	0.74	0.48	0.56		
Social media					0.56	0.65
Social media has made it normal for me to eat certain food[b]	0.51		0.3			
I'm not influenced to try new foods due to social media (R)[b]	0.72		0.54			
Resources					0.40	0.47
I eat whatever food I want, whenever I want[b]	0.4		0.31			
I never treat myself to expensive food (R)[a]	0.38	0.52	0.31	0.39		
I buy the best quality food[a]	0.55	0.55	0.32	0.35		
I don't mind paying more for better quality food[c]		−0.5		0.34		
I often buy new food products that are expensive[c]		0.39		0.3		
Healthy eating constraints						0.62
It is hard to change poor food habits (R)[c]		0.34		0.27		
I like unhealthy food (R)[c]		−0.55		0.46		
I can't afford to consider the healthiness of food (R)[c]		−0.3		0.38		
I always look for healthier food options[c]		−0.61		0.53		
I eat more junk food when I earn an income (R)[c]		0.39		0.42		
Food preparation						0.58
I only cook what I know how to cook[c]		0.66		0.48		
I don't enjoy cooking (R)[c]		−0.52		0.32		
I'm often too tired to cook (R)[c]		0.48		0.33		
I don't like trying new foods (R)[c]		−0.38		0.3		
I want to eat new food but I don't know how to prepare it[c]		0.5		0.29		
Satiety						0.67
I don't eat to be full (R)[c]		0.7		0.48		
I eat till I'm full[c]		0.73		0.56		
Weight						0.65
I consider losing weight when making food choices[c]		0.83		0.71		
I choose food that will help me gain weight (R)[c]		0.6		0.4		
Variance explained (%)	41	41				

[a] Items present in both solutions.
[b] Items exclusive to the seven factor solution.
[c] Items exclusive to the nine factor solution. (R) = item worded negative to the category.

0.77 and a significant Bartlett's test of sphericity ($p < 0.001$). A seven factor, 31 item solution emerged (Table 3). Cronbach alpha for the seven factors ranged between 0.62 and 0.89 and the variance explained by the solution was 44%. The social media, weight, satiety and convenience

Table 3
Factor loadings and communalities of 31 items and Cronbach alpha's for the seven factors obtained from EFA of 46 food choice items evaluated by n = 259 respondents (stage 3).

Items (n = 31 items)	Factor loadings	Communalities	Cronbach alpha
Healthy eating constraints (HEC)			0.79
1. I find it hard to change poor food habits	0.49	0.37	
2. Unhealthy food usually tastes better	0.47	0.37	
3. I can't afford to consider the healthiness of food	0.46	0.49	
4. I always look for healthier food options (R)	0.53	0.30	
5. When I have money to spend, I often choose junk food (Fast foods, savoury or sweet snacks, soft drinks, etc.) [a]	0.59	0.50	
6. I value the taste of food more than how healthy it is [a]	0.62	0.44	
7. I eat fast food on most days	0.57	0.36	
Meat appeal (MA)			0.78
8. Eating meat is not important for my health (R)	0.53	0.32	
9. It is important to me to eat meat at least once a day	0.71	0.54	
10. I choose not to eat meat (R)	0.59	0.46	
11. I'd rather buy cheap meat than no meat at all	0.55	0.42	
12. I prefer protein foods that are not from animals (R)	0.59	0.49	
13. A meal with no meat is incomplete	0.62	0.52	
Emotional eating (EE)			0.74
14. I never give in to my food cravings (R)	0.45	0.32	
15. I eat junk food (fast food, savoury or sweet snacks, soft drinks, etc) when I'm stressed*	0.62	0.43	
16. I crave sweet or fatty food when moody	0.76	0.6	
17. My moods and emotions don't dictate what I eat (R)	0.64	0.43	
18. I eat when I'm bored	0.39	0.33	
Quality seeking (QS)			0.62
19. I have no choice but to eat what is available to me (R)	0.34	0.34	
20. I buy the best quality food	0.60	0.39	
21. I don't mind paying more for better quality food	0.70	0.53	
22. I often buy new food products that are expensive	0.47	0.37	
Weather (WE)			0.89
23. I want to have certain food or drinks when the weather is cold	0.88	0.78	
24. I want to have certain food or drinks when the weather is warm	0.89	0.81	
Frugality (FR)			0.62
25. I always look for cheaper food options	0.37	0.30	
26. I don't check what food is on sale or special (R)	0.47	0.23	
27. I shop around to get the cheapest price or best deal	0.57	0.38	
28. I don't check prices before going to buy food (R)	0.55	0.35	
29. There are many food products that I can't afford	0.38	0.36	
Cooking constraints (CC)			0.68
30. I only cook what I know how to cook	0.77	0.60	
31. I want to eat new food but I don't know how to prepare it	0.56	0.36	
Variance explained (%)	44		

(R) = items worded negatively to the factor.
[a] Items reworded for increased clarity.

and taste factors were not retained due to either weak loadings (<0.3) or cross-loading in more than two factors by > 0.32 (Costello & Osborne, 2005; Schreiber, 2021). Furthermore, two items which were previously in the Convenience and Taste factor, "I value taste more than health" and "I eat fast food on most days," both loaded in what became the Healthy eating constraints factor. Since all but one of the items which formed the HEC factor were negative (R) in stage 2, the items were reported as is (thus not needing to be reversed) to align with the factor name.

6. Stage 4: Confirmation of food choice factors

6.1. Method

6.1.1. Questionnaire administration

A link to the 31-item, seven factor FCQ was distributed countrywide by email to a marketing agency's database of urban South African people, and through social media by the same marketing agency. Demographic information was collected (Table 1). To test convergent validity, items from the health, mood and price factors of the Steptoe et al. (1995) FCQ (rated on a 4 point scale: 1 (not important at all) to 4 (very important)) were included. The questionnaire also included preference questions for 10 product pairs (not described here).

6.1.2. Statistical analysis

The items worded negatively to their respective factors were reverse coded and then inputted into R (version 4.2.1) for confirmatory factor analysis (CFA) measurement based on the EFA model established in stage 3. The robust weighted least squares estimation method with direct oblimin rotation was used for CFA. The reliability of each factor was measured using Cronbach's alpha. Convergent validity was measured by Pearson correlation coefficients, by computing the mean value for the health, mood and price factors for each respondent as rated on the Steptoe FCQ, and similarly, the mean value of ratings given for HEC, EE and FR in the present study, using SPSS version 28 (IBM Corporation ®, New York, NY, USA).

6.2. Results

A total of 814 completed responses from people living in urban cities in all nine provinces of South Africa was obtained. The majority of respondents were women (69%) and black (58%). They also tended to be working class (30%), full-time employed (37%), between 18 and 35 years old (42%) and with high school education (45%) completed (Table 1). When it comes to decision making regarding food eaten and purchased in the household, 58% were the primary decision makers, 31% mostly had a say and 11% sometimes had a say.

6.2.1. Performance of 31-item model

The initial CFA model had a robust Tucker-Lewis Index (TLI) of 0.72, and a robust Comparative Fit Index (CFI) of 0.75. The Chi-square (χ2)/degrees of freedom (df) ratio was >3 and six items had factor loadings <0.3; this indicated a slightly poor fit in the anticipated 31 item model, although the robust RMSEA was acceptable at <0.8. Thus, CFA was conducted on sub-sets of the data to determine the model's stability across subgroups (Renner et al., 2012), i.e., women (n = 559), younger people (18–35 years, n = 339) and people with a lower income (monthly household income <R8000, n = 331) (Table 4). Compared to the whole group, the women subgroup showed the highest stability with a robust TLI of 0.79, a robust CFI of 0.82, a robust RMSEA of <0.8 and a (χ2)/(df) ratio <3 (Table 4). The Cronbach alphas of the food choice factors for the women sub-group were higher compared to the whole group.

6.2.2. Further refinement of the model to 19 items

Considering that the confirmatory measures for the 31 item model were slightly below the conventional criteria (TLI and CFI <0.9) (Hu & Bentler, 1999), a refining process was applied to explore an alternative model (O'Kane et al., 2022; Ruiz et al., 2023). This was done by first conducting EFA to see what model comes up and then confirm the emerging model using CFA. Similar to Renner et al. (2012) and Perry et al. (2015), the respondent data was randomly split into two groups, EFA was conducted on one group (n = 407) and the resulting model was confirmed by CFA on the other group (n = 407). The sample was adequate for EFA with a KMO value of 0.72 and a significant Bartlett's test of sphericity ($p < 0.001$). The EFA resulted in a 21 item, seven factor model which was a good fit when tested on the other group for CFA with a CFI and TLI of 0.92 and 0.89, respectively, a RMSEA of <0.08 and, a χ2/df ratio of 2.57 < 3. However, two items from the price factor ("I don't check what food is on sale or special (R)" and "I don't check prices before going to buy food (R)") had extremely low loadings (0.04 and 0.08, respectively). These items were removed as they also compromised the reliability of the factor (Cronbach alpha = 0.58). The CFA was repeated and this yielded a slightly different model (Table 5) with the following confirmatory measures: robust CFI = 0.98, robust TLI = 0.98, RMSEA <0.08, χ2/df ratio of 1.97 < 3 and all loadings >0.5. Furthermore, the Cronbach alpha for the factors ranged from 0.63 to 0.92 and the model explained 54.6% of the variance. In this model, the CC factor (k = 2 items) was removed and the MA factor was split into: Meat appeal (k = 3 items) and Meat avoidance (n = 3 items). Due to low loadings, some items from the HEC (k = 2), QS (k = 2), FR (k = 2) and EE (k = 3) factors were removed. A total of 12 items were removed, five of which were worded negatively towards their factors. Thus, factors with either exclusively negative (MA) or exclusively positive items (the rest) were retained.

Four of the seven factors had only two items. However, the correlations between those two items were positive and relatively high (i.e., EE, r = 0.63; QS, r = 0.58; Weather, r = 0.83 and FR, r = 0.59). The Pearson correlation coefficients showed discriminant validity of factors as no positive or significant correlations were found between the seven

Table 4
Confirmatory measures of the food choice model and reliability measures of the food choice factors for all respondents (n = 814), the younger respondents (n = 339), women (n = 559) and the lower income (n = 331) (stage 4).

Confirmatory measures:	n = 814 (all respondents)	n = 339 (age 18–35 y)	n = 559 (women)	n = 331 (lower income, <R8000)	Ideal values[a]
Robust Tucker-Lewis Index (TLI)	0.72	0.72	0.80	0.74	>0.9
Robust Comparative Fit Index (CFI)	0.75	0.75	0.82	0.77	>0.9
Robust RMSEA	0.07	0.08	0.07	0.060	<0.8
Chi-square (p-value)	<0.001	<0.001	<0.001	<0.001	<0.001
Chi-square/ degrees of freedom ratio (χ2/df)	>3	<3	<3	<3	<3
Reliability measures: Cronbach alpha α					
Healthy eating constraints	0.74	0.73	0.75	0.73	>0.6
Meat appeal	0.66	0.56	0.68	0.62	>0.6
Emotional eating	0.65	0.53	0.67	0.62	>0.6
Quality seeking	0.59	0.59	0.62	0.63	>0.6
Weather	0.91	0.89	0.89	0.88	>0.6
Frugality	0.6	0.64	0.6	0.57	>0.6
Cooking constraints	0.61	0.59	0.61	0.62	>0.6

[a] Brown and Moore (2012); Hu and Bentler (1999); Moss et al. (1998).

Table 5
Item loadings and Cronbach alphas of the refined 19 item, seven factor model, n = 407 respondents (stage 4, random split of group for EFA and CFA).

Items (n = 19 items)	Factor loadings	Cronbach alpha
Healthy eating constraints		0.75
1. I find it hard to change poor food habits	0.70	
2. Unhealthy food usually tastes better	0.62	
3. When I have money to spend, I often choose junk food (Fast foods, savoury or sweet snacks, soft drinks, etc.)	0.65	
4. I value the taste of food more than how healthy it is	0.60	
5. I eat fast food on most days	0.51	
Meat avoidance		0.63
6. Eating meat is not important for my health (R)	0.56	
7. I prefer protein foods that are not from animals (R)	0.59	
8. I choose not to eat meat (R)	0.65	
Meat appeal		0.70
9. I'd rather buy cheap meat than no meat at all	0.53	
10. It is important to me to eat meat at least once a day	0.65	
11. A meal with no meat is incomplete	0.84	
Emotional eating		0.77
12. I eat junk food (fast food, savoury or sweet snacks, soft drinks, etc) when I'm stressed	0.82	
13. I crave sweet or fatty food when moody	0.76	
Quality seeking		0.73
14. I buy the best quality food	0.73	
15. I don't mind paying more for better quality food	0.79	
Weather		0.92
16. I want to have certain food or drinks when the weather is cold	1.02	
17. I want to have certain food or drinks when the weather is warm	0.83	
Frugality		0.73
18. I always look for cheaper food options	1.03	
19. I shop around to get the cheapest price or best deal	0.56	
Variance explained (%)	54.6	

(R) = item worded negative to the factor.

factors (Supplementary Table S3). The relevant factors had the following correlations with the Steptoe FCQ: HEC vs Steptoe health ($r = -0.25$, $p < 0.001$); EE vs Steptoe mood ($r = 0.37$, $p < 0.001$) and FR vs Steptoe price ($r = 0.98$, $p < 0.001$).

7. Discussion

7.1. Establishing the factors from stage 1 through 4

EFA, conducted on 123 statements from stage 1, resulted in two mathematically sound models at stage 2, both explaining 41% of the variance. Owing to the intricate and complicated nature of food choice motives (Köster, 2009), a statistically robust set of items which represents the factors as well as possible requires multiple iterations. There is currently no standardised series of steps to follow when conducting EFA iterations (Samuels, 2017; Schreiber, 2021). Thus, the two models were combined, leading to a 46-item, 11-factor solution to explore for redundancies as lengthy questionnaires tend to induce fatigue in respondents (Carpenter, 2018; Jaeger & Cardello, 2022) and a risk for data of poor quality (Galesic & Bosnjak, 2009). However, the reduced number of items must reflect the factors that drive food choice as much as possible (Renner et al., 2012).

The emerging factors at stage 2 were mostly as expected, including: price and availability of resources; EE; MA; convenience and taste; WE; social media; resources; HEC; food preparation; satiety; and weight. Items related to convenience and taste and those related to price and availability of resources loaded together, which was unexpected. Not all items on ethical and environmental concerns; food safety and spoilage; and culture, beliefs and religion were included in this model due to low or cross loadings. Thus, the value placed on items related to these factors varied highly amongst the respondents.

Testing with a different set of respondents (stage 3) led to the removal of four factors (satiety; weight; social media; convenience and taste) and several items. A low loading indicates an insignificant contribution to a factor, especially if it is not logically related to the other items (Beavers et al., 2013). Two items that were previously in the convenience and taste factor ("I value taste more than health" and "I eat fast food on most days") loaded strongly in what became the HEC factor. Thus, these items were more correlated to health than to convenience in this population. The resulting 31-item, 7-factor model had factors with improved reliability (Cronbach alpha 0.62 to 0.89) and explained 44% of the variance (3% more than the previous models).

Up to this point, a mostly young and educated population, dominated by women, served as respondents. Therefore, the model was confirmed on a demographically diverse population, as recommended by Lyerly and Reeve (2015) and Murphy et al. (2021). A slightly different fit from what was expected was observed, however the model fit was best for the women sub-group, possibly reflecting the fact that a majority of earlier respondents were women. Women are more often responsible for household food purchases and preparation than men (Erzse et al., 2021; Masuku et al., 2023; Tibesigwa & Visser, 2016), thus they are likely to be aware of their food choice drivers, allowing them to provide coherent responses. Nevertheless, Perry et al. (2015) asserted that the good-fit criteria values established by Hu and Bentler (1999) for determining validity (CFI and TLI) are almost impossible to attain, especially with respondents different from those used to develop the items. Also, the criteria by Hu and Bentler (1999) are based on continuous data, whereas, the Likert-type data of this study is categorical. However, due to the lack of an alternative criterion more suitable for categorical data, using the cutoff criteria by Hu and Bentler (1999) is still the conventional approach (Savalei, 2021; Xia & Yang, 2019). Furthermore, the Chi square ($\chi 2$) value is said to be the most accurate reflection of the validity of a model (Perry et al., 2015), and for the 31-item model, the $\chi 2$ values were significant for all sub-groups.

The differences noted in the model during stage 4, compared to the anticipated factor structure, may be due to demographic differences in respondents. Several negatively worded items were removed due to low loadings that can possibly be attributed to cognitive demands to the respondents who were less educated than those at earlier stages. Despite the benefits of negatively worded items, i.e., reduced response bias (Aithal & Aithal, 2020; Sauro & Lewis, 2011), such items can be misread or misunderstood (Sonderen et al., 2013), especially when they are alternated with positively worded items (Jaeger & Cardello, 2022) - as was the case here. Also, rewording of three items may have slightly changed their meaning, leading to different ratings and then to an impact on the factorial structure.

Regarding the respondents, the first pool of items was developed through focus group discussions with low, middle and high income participants (stage 1) while the subsequent item reduction studies (stages 2 and 3) involved mainly young, educated respondents. The latter were not representative of the South African population although they had features in common with the group at stage 4: they were mostly young and many were food insecure. In addition, these respondents (stage 2 and 3) will be future decision makers in households and therefore suitable as informants for the present topic. The majority of them were women, as is often the case in similar studies (Jaeger & Cardello, 2022).

7.2. Two alternative models

Two alternative tools for measuring food choice drivers, longer (31 items) and shorter (19 items), were identified in this study. Their advantages and disadvantages are summarised in Table 6. The 31-item model has seven factors (HEC; MA; EE; WE; QS; FR; and CC). The

Table 6
Advantages and disadvantages of the 31- and 19-item food choice models developed in this study.

	Advantages	Disadvantages
31 item model	• Addresses more food choice dimensions • Provides a more descriptive array of food choice motives	• Confirmatory measures, TLI and CFI[a] slightly below good fit criteria
19 item model	• TLI and CFI[a] measures fulfil criteria for good fit	• Four factors have only two items, a minimum of three is required • Less descriptive view of food choice drivers

[a] TLI (Tucker-Lewis Index), CFI (Comparative Fit Index).

refined 19-item model also has seven factors (HEC; MA; Meat avoidance; EE; QS; Weather; and FR) and it specifically highlights QS aspects and separates items positive to meat eating from those against. Overall, the 31-item model is probably more useful as it covers food choice motives more thoroughly, thus leading to a better understanding of the food choice drivers of the study population.

The refined 19-item model was an attempt to achieve an improved model fit, but with seven factors it turned out to be short of items. Each factor ought to have at least three items (Costello & Osborne, 2005; Samuels, 2017), however, this model yielded four out of the seven factors with two items only. This is justifiable under certain conditions, namely: 1) if the two items are highly correlated ($r > 0.70$) (Worthington & Whittaker, 2006; Yong & Pearce, 2013), or 2) highly uncorrelated with items in other factors (Yong & Pearce, 2013) or, 3) if the factor is clearly defined and distinct from the other factors (Schreiber, 2021). The correlations of four 2-item factors ranged from 0.58 to 0.83, with one of them exceeding 0.70, thus only two of the three conditions (2 and 3) were met.

7.3. Comparison with other studies on food choice motives

The present study resulted in three factors referring to dimensions similar to those of Steptoe et al. (1995), i.e.: health, mood and price. To provide a comparison and a measure of convergent validity, respondents of stage 4 rated these three sets of items on Steptoe's importance scale. Unlike the health items in the Steptoe FCQ, the health items retained here were negative towards health and they described barriers to healthy eating. This explains the low and negative correlation between the two measures. The result highlights the importance of careful inspection of the content of a factor, thus items that form a factor. Health has been a distinct factor in most other studies on food choice motivation, but items defining a factor, and rating scales used, vary and therefore operational definitions of a factor also vary widely. The Steptoe et al. (1995) health items, rated on a 4-point importance scale, are strictly associated to nutrients and nutrition, Renner et al. (2012), collecting ratings from never to always, and Roininen et al. (2001) and Arbit et al. (2017), using a Likert scale, lean towards perceived well-being and caring for one's body. Lyerly and Reeve (2015) rate importance but focus on weight and calories only. Kokkoris and Stavrova (2021) rate healthy food buying and general health habits.

Continuing on convergent validity between the Steptoe et al. (1995) factors and the present study, Steptoe's mood items measure using food as a coping mechanism, whereas, mood-driven eating behaviours were measured here. Price and mood exist in other food choice motivation surveys such as TEMS (Renner et al., 2012) and the FCV (Lyerly & Reeve, 2015). However, the price-related items in these and Steptoe et al. (1995) questionnaires speak towards the value-for-money aspect of food while an item like "there are many products that I can't afford" included in the FR factor here may refer to a respondent's financial means or food purchasing power instead.

Four out of seven factors (MA, QS, QS and WE) confirmed in the present study were different (or new) in the 31-item model from those observed by Steptoe et al. (1995), Arbit et al. (2017) and Renner et al. (2012). This suggests that food choice drivers are different in this emerging economy, compared to Western societies. Further examples of such diversity include natural concern in Germany (Renner et al., 2012) or product labeling in Ireland (Lavelle et al., 2017), which did not feature here. It is worth noting that the meat factors in both models are the only ones specifically dedicated to meat as a food type, while the rest can be applied to various foodstuffs. Although unusual compared to other food choice instruments, the presence of a distinct meat-related factor is appropriate and fitting in this context. For many Africans, eating meat is aspirational and an important part of culture and socialisation (Mensah et al., 2022); everyday meals and special occasions are also planned and built around meat (Asamane et al., 2021). In contrast, people in developed countries like Australia, Canada, Belgium, Germany, France, the United Kingdom and Singapore are in the process of adjusting to eating less meat (Clark & Bogdan, 2019; Malek et al., 2019; Michel et al., 2021; Sheen et al., 2023), and therefore meat may lose its significance in these countries. The meat factor might also serve as a useful scale to predict sustainability practices pertaining to food and diet choices. Surprisingly, despite weather persisting as a driver of food choice in this study, it has not been reflected in any other food choice measurement output. Compared to developed countries, there is often much less infrastructure (e.g. insulation or central heating) to protect people from temperature extremes during the warm and cold seasons. Thus, it is more probable that people in South Africa would rely more on food to either cool down or keep warm; hence weather being a significant food choice driver.

Food choice is complex because of competing and contradictory motives. For example, one can agree to an item like "I don't check prices before going to buy food" and "there are many food products I can't afford" and both can be true for the same individual. Although not surprising, this brings noise into the data. Furthermore, certain items can be true for certain food products but not others, for example, respondents may value quality in certain food products but not others. Despite these complexities, the 31 item model showed best fit for women. Considering it's purpose and context of development, we have titled the 31-item model the Food Choice Questionnaire for Emerging Economies (FCQ-EE).

As for the limitation of the study, the generation of the initial pool of food choice motives and their refinement depended on a selected group of participants during a particular time and in a certain geographical region. Different participants in another context might produce a different outcome. Careful effort was taken to make the study as inclusive as possible but we acknowledge that the food choice motives emerging in the present study are not an unbiased or complete picture of the motivational space of food choice in emerging economies. Rather, they provide a starting point for understanding food choice in societies where the lack of affluence and food insecurity are a daily reality for a large portion of the population. In the present study, a few observations were made regarding discriminant and convergent validity, but further testing is necessary to establish the predictive validity of the instrument across various contexts. A questionnaire may meet validity thresholds (i.e. CFI and TLI), with items forming the expected factors in one population, but behave differently in another. For example, slightly different factors formed when the Steptoe FCQ was applied in Cape Verde (Cabral et al., 2017). The ability of the FCQ-EE to predict the selection of food is currently being investigated in another study and the initial results seem promising (Dlamini et al., Note 1).

8. Conclusions and recommendations

The findings give an idea of what drives peoples food choices in an emerging economy and offer a tool for researchers in low-middle income countries to measure food choice motives. The 31-item model (FCQ-EE) covers more food choice aspects than the 19-item model, thus providing a more thorough perspective of what people consider when buying or

consuming food. The set of items, when applied to different populations can be leveraged for demographic-specific diet intervention strategies and provide insights for the development of new food products. The validity of the questionnaire as a predictor of food choice requires further evidence, thus applications on specific choices across different populations and situations.

Ethical statement

Approval for the study was granted by the University of Pretoria's Faculty of Natural and Agricultural Sciences' ethics committee (reference number NAS131/2021).

Reference notes

Dlamini, N., Tuorila, H., de Kock, H.L. Predicting food choices by motives identified in an emerging economy. Manuscript.

CRediT authorship contribution statement

Nomzamo N. Dlamini: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Gopika Ramkilawon:** Formal analysis. **Hely Tuorila:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Henrietta L. de Kock:** Writing – review & editing, Supervision, Methodology, Funding acquisition, Conceptualization.

Declaration of Competing interest

The manuscript contains original thoughts of the authors, which have not been published anywhere. We declare that no known conflict of interests associated with the publication that could have influenced the work reported in this paper. We confirm that the manuscript has been read and approved by all authors for submission.

Data availability

Data will be made available on request.

12.0 Acknowledgements

This work received funding from the National Research Foundation of South Africa (grant No MND200416513776) and the European Union's Horizon 2020 research and innovation programme under grant agreement No 862170 for project InnoFoodAfrica.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2024.107535.

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