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RESEARCH

Validity and reliability of a questionnaire developed to explore nutrition determinants among construction workers in Gauteng, South Africa

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Objectives: The nutrition of construction workers is related to their health and safety (H&S) at work. Research on the factors influencing construction workers' food choices and overall nutrition is limited, in South Africa and indeed Africa as a whole. The present paper aims to develop and validate a questionnaire on factors influencing construction workers' food choices.
Design: The study adopted a quantitative approach; 42 items, divided into six constructs, were used to develop a field-survey questionnaire after a detailed literature review.
Setting: The study was conducted on eight construction sites (consisting of five building construction and three road construction sites), chosen through heterogeneity sampling, in Midrand, Centurion, Johannesburg and Samrand.
Subjects: Participants included construction workers actively involved in site activities.
Outcome measures: Principal components analysis (PCA) was conducted to examine the structures and validity of the constructs. Cronbach's alpha test and mean inter-item correlations were used to examine internal consistency reliability.
Results: After repeated factor analysis, the questionnaire on food-choice factors revealed seven different factors: food context, biological factors, nutritional knowledge, personal ideas and systems, economic factors, resources and cultural background. These factors explained 60.09% variance. Cronbach's alpha coefficients ranged from 0.62 to 0.85, signifying good internal consistency reliability.
Conclusion: The determinants of construction workers' food choices are vital considerations when designing and implementing nutrition interventions in the South African construction industry. Future research can adopt the instrument and developed model when conducting psychometric evaluations of construction workers' food-choice determinants.

Keywords: construction workers, food choice, health, nutrition determinants, reliability, validity

Introduction

As far back as a thousand years ago, the vital role of workers' nutrition in producing high-quality work was understood. The International Labour Organization (ILO) has been concerned with adequate nourishment of workers, food safety and education for general health, safety and work productivity since its establishment.[1] Nutrition is an occupational health and safety (H&S) concern and an integral part of workers' health and overall well-being. It has also been recognised that the health and well-being of workers impact on their safety performance and productivity. The concept of health and well-being was emphasised in a joint definition by the World Health Organization (WHO) and the ILO, which defined it as:

'… the promotion and maintenance of the highest degree of physical, mental, and social well-being of workers and the prevention of departures from health caused by working conditions, the protection from risks resulting from factors adverse to health, the placing of workers in an environment adapted to their physiological and psychological capabilities….'[3,4]

The cost of workers' poor health and well-being is significant, costing companies and economies millions in health care and losses in productivity as a result of presenteeism, absence from work due to accidents, and so on.[3] Data from the European Union revealed that, about 3.2% (6.9 million) of the workforce in 27 member states reported an accident at work, with the cost of accidents at work and occupational illness accounting for about 4% of Gross Domestic Product (GNP) globally. The benefits of healthy eating and overall workers' health and well-being, including, inter alia, improved morale, sense of well-being, and productivity as well as reduced absenteeism, healthcare costs, stress, staff turnover and lower stress levels, are greater for low-paid workers in high-risk and high-energy expenditure occupations and settings, such as the construction industry.[2,4,5] Nutritional deficiencies are one of the effects of many lifestyle behaviours (such as unhealthy eating), which interact with workplace hazards and can lead to accidents, injury, illnesses, incapacity and death.[4]

Thus, ensuring that construction workers' nutrition is improved is important, especially given the physically demanding and dangerous nature of construction work and the ever-increasing demand to improve the appalling image of the construction industry with regard to its H&S performance. Safety on construction sites is linked to working conditions, including provision of catering facilities to ensure that workers eat healthily. The importance of healthy eating for energy-expendable activities was emphasised in a study that indicated relationships between and among healthy diet, health status and performance of workers.[5] Obesity, which is one of the outcomes of unhealthy eating, is related to higher absenteeism, occupational diseases and lower productivity.[6,7] In addition, high levels of stress can be associated with poor diets and low physical activity, which may in turn result in lowered concentration, activity limitations, disability days, absences, work injuries and accidents.[7]

Thus, improving construction workers' nutrition is of paramount importance if their health, safety, well-being and indeed productivity are desired, since a workforce provided with adequate and healthy food would remain healthy in mind and body, and able to perform their tasks. Improving nutrition of a particular group requires an understanding of the factors that determine their food-choice decisions because food choices, eating behaviours and resulting nutritional health of individuals differ and these are influenced by a complex range of interrelated individual, collective and policy-related determinants.[8]

Much research has been conducted on nutrition determinants. Reviews have been written without construction workers as the focus.[9] Some literature has focused on only young construction apprentices in Australia.[10,11] Other studies have had a broad scope and employed qualitative methods[12,13] and, more recently, a relationship between nutrition determinants and particular choices of food among construction workers was explored in South Africa.[14]

Further, validated models of food-choice motives exist.[15–19] However, the factor structures evinced in these studies do not necessarily cater for or reflect the most important factors in other cultures and might have different connotations across different populations and cultures. For instance, health and non-health related factors including income, age and weight control, among adults aged 18 to 87 years, were addressed in a principal study that developed and validated a food-choice questionnaire (FCQ).[15] Nine factors emerged including health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity and ethical concerns. However, the sample was not culturally diverse and included elderly participants whose food choices may differ from those of actively engaged individuals such as construction workers. Many FCQ validation studies were subsequently based on this fundamental model. For instance, the FCQ was validated among a culturally diverse population of Japanese, Taiwanese, New Zealanders and Malaysians, but included female consumers only.[16] African countries were excluded in another study.[17] Conversely, other studies modified the FCQ and validated it amongst population including Africans, but on secondary school students.[18, 19] Therefore, there may be other important factors that existing food-choice models are not addressing or indeed more appropriate questions within each factor, which makes their applicability limited in cross-cultural situations.[14,16] Moreover, these factor structures have not been explored among construction workers in South Africa and indeed Africa as a whole. The current paper incorporates all factors that could possibly influence construction workers' food choices to develop a theoretical framework of food-choice factors and explore the underlying constructs using principal components analysis. The validity and reliability of the emerging empirical construct was assessed thereafter. The objective of the current paper is therefore to combine evidence from extant literature of factors that could possibly influence construction workers' nutritional choices; to explore underlying relationships and constructs; and to examine the validity and reliability of the theoretical constructs.

Evidence from the literature revealed that the choices people make about food determine which nutrients enter their body and these choices are influenced by many interrelating factors. The theories on which the factors were based were extensively discussed in a previous publication by the authors.[14] The current study is differentiable from the extant publication because the previous one evaluated the extent of the influence of nutrition determinants on the food choices of construction workers, whereas the present one is based solely on the process of developing and validating the questionnaire used for the research. The succeeding sections present the methods adopted as well as the results.[14]

Methods

Development of questionnaire

After an extensive survey of literature related to workers' food-choice factors, the identified theorised factors were used to develop a five-point Likert scale questionnaire. New instruments could be developed when available instruments do not measure some or all key aspects.[20] In the absence of a measurement tool to give a better evaluation of the food-choice determinants of construction workers in a multicultural country like South Africa, a new questionnaire was developed. A draft questionnaire was structured with closed-ended questions in English. The draft questionnaire was reviewed by the researcher's supervisor and co-supervisor to check the suitability of the questions and to check whether the questions reflect what they were supposed to measure (face validity). Thereafter, the questionnaire was reviewed by a statistician to check the appropriateness, structure and simplicity of the questions. The draft questionnaire was then pilot-tested. The pilot study served only to further identify problematic or complex questions in terms of the wording and structure of questions in order to eliminate misinterpretation.[21] Subsequently, some questions were reviewed and revised in order to refine the questions to make them more applicable to the target population,[22] as well as non-leading, before the main study. For instance, one of the factors, *household income* was deleted; and 'What I should eat in a day' was revised to 'What an adult should eat in a day'. The final questionnaire comprised 42 questions divided into six constructs/factors. Response categories ranged from 1 = strongly disagree to 5 = strongly agree.

Collection of data

The participants included in the main study were selected through purposive, heterogeneity and convenience sampling techniques. Although the study sample was multiracial, English was used because the researcher was not proficient in other South African languages. Effort was therefore made to purposively include participants who could read and understand English. It is important to note that construction workers may be unskilled, but they have basic education. In addition, some attend technical colleges and are able to understand English.

A heterogeneity sampling technique was also employed because the aim was to include as many diverse views as possible.[23] Effort was made to include workers from different construction establishments involved in building, civil engineering and general construction projects in order to enhance generalisability of the results. Eight construction sites in Midrand, Samrand, Centurion and Johannesburg were selected. Participants at the sites were chosen purposefully and conveniently. They included workers who were actively engaged in physical construction activities as opposed to the site managers and supervisors. Purposive sampling is based entirely on the judgement of the researcher and there is greater chance of personal bias, which could, however, give good results if done with care.[24]

Ethical considerations were attended to while conducting the research. Ethical clearance was obtained from the university's Ethics Committee before undertaking the study. Prior to administering the questionnaires, permission was obtained from the site manager/supervisor and/or the safety officer at the construction sites. A covering letter was included to enlighten the respondents and their supervisors on the purpose of the study. The covering letter also provided assurance of anonymity, confidentiality of responses and voluntary participation. Of a total of 220 questionnaires distributed, 183 were returned and used for empirical analysis. Table 1 shows the response rates from the different sampled settings. The participants included 89% male and 11% female respondents, 21% unskilled workers, 16% bricklayers; 15% comprised glass fitters, painters, cleaners and manhole specialists, 14% electricians, 10% carpenters and plumbers, 9% steel fixers, and 5% pavers.

Analysis of data

Raw data were subjected to Principal Components Analysis (PCA) using the Statistical Package for Social Sciences (SPSS®) version 22 software (IBM Corp, Armonk, NY, USA). Prior to the PCA, data were screened for normality, outliers, missing data and sampling adequacy.

Data cleaning and screening

Preliminary descriptive analysis of data was conducted to check for normality. Outliers were identified and removed before analysis. Missing data were excluded using listwise deletion. The suitability of data for factor analysis was also assessed. The correlation matrix was inspected for evidence of coefficients greater than 0.325. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were applied to assess the factorability of the data-set. A KMO index of 0.6 is the suggested minimum value for a good factor analysis. Bartlett's test of sphericity should be significant ($p < 0.05$) for the factor analysis to be considered appropriate.[25]

Principal components analysis

As mentioned earlier, PCA was done in order to test the structures and composition of the food-choice determinants theorised from the literature. The 42 items were subjected to repeated PCA. Principal axis factoring and direct oblimin rotation were used. Two frameworks emerged from the PCA. One was adopted as the final framework. The results are presented in the next section. Outputs from the PCA (principal components) were thought to contribute to the variance in the data-set. They were obtained using Kaiser's criterion (retaining eigenvalues above 1) and a scree test (retaining factors above 'breaking point').[25]

Table 1: Response rates from the selected sites

Description of setting		Distributed	Received
Building	**Trading centre (new construction)**	**40**	**24**
	Office property sites (new additions at basement stage)	60	47
	New hospital site (7 two-storey hospital buildings)	75	67
	Students' residence (new construction)	16	16
	Residential property (renovation)	10	10
	Total	201	164
Road	One extension and two maintenance projects	19	19
Total		220	183

Evaluation of validity and reliability of theoretical framework

Various measures were taken to ensure that the variables developed from the extant literature, as well as subsequent empirical structures/constructs, are valid and reliable.

Validity testing

Some of the measures undertaken to ensure validity of the study results have been highlighted above. Through a detailed literature review and synthesis, expert reviews and validation, as well as pilot-testing of the questionnaire, construct validity of the theoretical variables was achieved. Pilot-testing and expert/professional content reviews served to enhance face and test content validity (that is, the extent to which a scale's items, in the aggregate, constitute a representative sample of the topic's content domain.[26,27] Including workers from different locations in Gauteng during data collection served to enhance external validity (good generalisability).[23]

Statistically, construct validity was also demonstrated through the application of factor analytic techniques (specifically, principal components analysis) to determine whether a factor represents the construct that it is intended to measure and does not represent others that are theoretically different.[27]

Reliability of developed questionnaire

Internal consistency, which gives an estimate of the equivalence of sets of items from the same test and the reliability of measurement based on the assumption that items measuring the same construct should correlate, was assessed.[20] Cronbach's alpha coefficient α and mean inter-item correlations were applied to assess internal consistency reliability. Cronbach's alpha represents average correlations among items on a scale and is used when questions are rated on internal scales such as five-point Likert scales.[28] Cronbach's α values should ideally be above 0.7.[25] The alpha index for the theorised framework was 0.83, indicating good internal reliability. The questionnaire was therefore considered to be reliable and representative of what was to be measured. Because α values are sensitive to the number of items in the scale, the mean inter-item correlations could also be reported, with acceptable values ranging from 0.2 to 0.4.[25] The empirical framework emerging after the PCA was further tested using Cronbach's alpha and mean inter-item correlations in order to demonstrate reliability of the emerging model of nutrition determinants.

Results

Some of the results presented here have been presented in previous studies by the authors.[14,29] However, the current paper focuses on the validity and reliability of the research instrument developed and presents additional data that were useful in improving and refining the scale.

Preliminary screening results

Preliminary descriptive analysis of data revealed a normal distribution. Inspection of the correlation matrix revealed the presence of many coefficients at 0.3 and above. The Kaiser–Meyer–Olkin value was 0.743, exceeding the minimum recommended value of 0.6 for good factor analysis and Bartlett's test of sphericity reached statistical significance ($p = 0.000$), supporting the factorability of the correlation matrix,[25] indicating that correlations existed among the factors and the correlation was not unit matrix.[30]

Results from principal components analysis: empirical framework

The 42 items were subjected to two rounds of PCA. Results revealed that 11 or 7 components could be extracted for further interpretation and analysis. In the first run, 11 components exceeded eigen values above 1 (10.679, 4.145, 2.879, 2.241, 1.883, 1.818, 1.592, 1.432, 1.377, 1.300 and 1.117), explaining 25.43, 9.87, 6.85, 5.34, 4.48, 4.33, 3.79, 3.41, 3.28, 3.10 and 2.66%, respectively, of the variance, and accounting for a total variance of 72.53%. The results of the scree test also revealed a break after the eleventh component. This was further supported by the results of the pattern matrix, which also shows the labelling of the components extracted and the items loading evenly on all the components extracted. However, due to the large number of components extracted, the difficulty in naming them, the low internal consistency reliability of some of the components, as low as 0.54, and the low communality value of many of the factors after extraction (see Table 2), a decision was made to re-run the rotation. The communalities table provides information on how much of the variance in each item is explained. Low values indicate that the items do not fit well with the other items in its component.[25] Thus, with a number closer to the expected number or to the originally theorised framework, the rotation was re-run to increase internal consistency reliability of the components. After the second analysis, seven common factors were extracted and interpretation revealed that items loaded evenly on all seven principal components, accounting for 60.09% variance in the data-set (see Table 3).

Refining the scale

From Table 3, it can be seen that one of the items under food context, that is, "What I am used to from home and family tradition', still had a very low loading (0.279), suggesting that it may not fit well with the items in that component and needed to be removed. It is noteworthy that this measure also had a low communality value (0.294) with the 11-factor solution. This suggested that it did not fit well with other items in the food context component. In other words, *family norms and traditions* was too minor to suggest practical importance and, as such, it was removed from further testing.

Internal consistency reliability of empirical framework

The reliability of the results was assessed using the Cronbach's alpha values and the mean inter-item correlations. The initial theoretical constructs had alpha values ranging from 0.71 to 0.84, indicating good internal consistency. However, with the removal of the low-loading factor as explained above, reliability values improved. The internal consistency of the seven constructs improved, ranging from 0.62 to 0.85, as shown in Table 4.

The inter-item correlation matrix was also examined for negative values, which could indicate that some of the items had not been correctly scored or reverse-scored. The recorded indices for the seven factors were all positive (Table 4) suggesting that the items were measuring the same underlying characteristic.[25]

Both the Cronbach's alpha and mean inter-item correlation indices indicated that the constructs met the requirements for internal consistency of constructs. Therefore, the constructs and their indicators are believed to be adequate for psychometric assessment of construction workers' food-choice factors.

Discussion

Research conducted on food-choice motives or nutrition determinants abounds. However, it was unclear whether the questions and structures in extant models accurately represent the diversity of perceptions and capture the full range of the factors relevant to food selection among construction workers, especially in culturally diverse settings such as South Africa.[14] There was therefore a need to conduct research on food-choice determinants and validate a model/questionnaire that could be particularly related to construction workers in South Africa. The identification and separation of correlated and uncorrelated variables as necessary was possible through PCA. The loading of items on the seven factors extracted seemed to suggest that there was convergence amongst the measures, i.e. testing the seven constructs resulted in certain items converging together on each construct (component).[30] Where questions had a high loading on the same factor, it may suggest that respondents who gave a particular answer to one of the questions tended to give a similar answer to the other questions.[31] Similarly, the converging items did not load as heavily on any other factors. This means that there was also sufficient discrimination amongst items that are thought to be unrelated in reality. Thus, the pattern of item loadings provides support, in real data, for the validity of the seven constructs.[30] In line with extant literature, the components which emerged can be identified as:

- *Food context*, which defines the environment and specific setting (time, place or location) in which food choices occur, encompassing the physical surroundings, social climate of the choice setting, and specific food-supply factors in the environment such as types of food, food sources and availability of foods in the food system, including seasonal and market factors.[9,12,32]
- *Biological factors*, which represent physiological needs and sensory aspects of the body, including hunger, appetite, satiety, palatability, taste, smell, appearance and texture of food.[8,9]
- *Nutritional knowledge*, which consists of four basic and essential aspects of nutritional knowledge, including knowledge about food sources of energy, knowledge about sources of different nutrients in food, knowledge about the health implications or consequences of consuming or not consuming particular foods, and knowledge about the recommended daily dietary requirements.[33]
- *Personal ideas and systems*, which was used to describe previously resolved deliberations and values that may stem from consideration of health status and benefits, managing relationships (*peers/colleagues' influence*), society's food ideology (*the need to belong to a social group, social media and networking*), family environments, media and personal experiences, and which become habitual over time.[32,34]
- *Economic factors*, which was used to describe cost of food, availability of food, wages and foods on special offers and discounts.[8]
- *Resources*, including the assets (which could be tangible or intangible) that individuals consider in making food-choice decisions, for instance, equipment (such as freezer, pantry space), space, knowledge, values, relationships, and so on.[12,32]

Table 2: Communalities

Measures	Initial	Extraction
What I know an adult should eat in a day	0.525	0.284
What I know would give me different nutrients, e.g. proteins, carbohydrates, vitamins and minerals	0.754	0.584
What I know will give me energy	0.708	0.694
What I know can happen to my health if I eat or don't eat particular foods	0.635	0.480
What I know my body size needs	0.751	0.443
What I know my body needs at my age	0.687	0.547
What I know my body needs for my current health status	0.772	0.561
What I know my body needs for the type of work I do	0.611	0.421
What I know I should eat as a man or woman	0.738	0.557
My cooking skills	0.729	0.468
The wages I am paid	0.746	0.595
The foods available	0.719	0.637
The cost of the food	0.706	0.719
The way the food is advertised or marketed	0.735	0.481
The brand name	0.791	0.648
The foods on special offers or discounts	0.518	0.456
The location of where the food is sold	0.742	0.429
The food in season	0.754	0.580
The time I have before work and during breaks	0.770	0.642
The eating facilities provided on site, e.g. benches, tables, washing bowls/sinks, etc.	0.883	0.704
The facilities on site for storing and heating up my food	0.875	0.766
What my friends choose for us to eat	0.775	0.494
What I am used to from home and family traditions	0.596	0.294
Social media and networking	0.759	0.554
The need to belong to a particular social group	0.690	0.431
My belief that I should only eat food from my culture	0.760	0.597
My belief that killing animals for food is not good	0.790	0.566
My belief that avoiding meat will keep me healthier	0.822	0.663
My belief that avoiding meat will save me money	0.779	0.635
My belief that my current diet is adequate	0.560	0.285
The fact that healthy food will help increase my productivity at work	0.679	0.437
The fact that healthy food will help me concentrate on my work and avoid accidents and injuries	0.583	0.393
My idea that I will add or lose weight with particular foods	0.664	0.361
My idea that particular foods are advertised for the benefit of the sellers or advertisers	0.651	0.412
My mood, e.g. happy, sad, stressed, etc.	0.736	0.501
My eating habits, e.g. adding salt no matter what, having my food with beer or juice instead of water, eating something sweet after a meal, eating the same cereal every day	0.707	0.516
How hungry I am	0.744	0.513
The taste of the food	0.727	0.695
My appetite for particular foods	0.644	0.482
The feeling of fullness I get from the food	0.757	0.559
The quality of the food	0.719	0.407
How presentable the food is	0.720	0.601

- *Cultural background*, which comprises elements of beliefs, knowledge, religion, ethnicity, customs and habits that an individual has or which a group of people share.[35,36]

The above discourse evinces that some of the constructs identified in the current study are similar to previous studies.[12,13,33,34] For instance, the emerging nutritional knowledge measures correspond with a study which reported that nutritional knowledge was essentially based on awareness of what a healthy diet means, sources of nutrients, nutritional requirements and consequences of consuming or avoiding certain foods.[33] However, this finding is slightly different from more recent research, which found that nutritional knowledge is indicated by three factors, namely: knowledge of diet–disease relationship, of nutrient content of foods and of dietary guidelines.[37] In addition, the seven-factor model with 41 items

Table 3: Loading matrix and percentage variance of the extracted factors after second run

Constructs	Measures	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Food context	Brand name	***0.726***	0.180	0.065	0.074	−0.013	−0.153	−0.147
	Food in season	***0.694***	−0.027	−0.024	0.084	0.056	0.024	0.123
	Time I have before work and during breaks	***0.551***	0.051	0.017	−0.067	0.027	−0.134	0.373
	Location of where the food is sold	***0.540***	0.046	−0.065	0.118	−0.073	−0.123	0.064
	Cooking skills	***0.482***	−0.029	0.038	−0.061	0.078	0.013	0.369
	The way the food is advertised or marketed	***0.469***	0.178	0.020	0.133	−0.010	−0.158	0.121
	What I am used to from home and family traditions	***0.279***	0.113	−0.016	0.129	0.201	−0.137	0.106
Biological factors	The taste of the food	0.156	***0.765***	0.283	−0.093	−0.030	0.139	0.110
	my appetite for particular foods	0.186	***0.623***	−0.007	0.020	−0.081	−0.086	0.054
	How presentable the food is	−0.002	***0.612***	−0.323	0.067	−0.043	−0.243	0.122
	The feeling of fullness I get from the food	0.015	***0.576***	−0.046	0.005	0.346	0.060	0.012
	The quality of the food	−0.096	***0.564***	0.009	0.115	0.031	−0.142	−0.061
	how hungry I am	−0.016	***0.507***	0.108	0.149	0.307	0.158	0.057
Nutritional knowledge	What I know will give me energy	−0.177	0.046	***0.786***	0.085	0.172	0.149	0.074
	What I know would give me different nutrients, e.g. proteins, carbohydrates, vitamins and minerals	−0.123	0.105	***0.721***	0.069	−0.094	−0.163	−0.091
	What I know can happen to my health if I eat or don't eat particular foods	0.228	0.206	***0.427***	−0.128	0.178	−0.270	−0.099
	What I know an adult should eat in a day	0.180	−0.138	***0.404***	−0.043	−0.030	−0.086	0.122
Personal ideas and systems	My eating habits, e.g. adding salt no matter what, having my food with beer or juice instead of water, eating something sweet after a meal, eating the same cereal every day	−0.058	0.256	−0.124	***0.610***	0.023	−0.010	0.038
	My idea that particular foods are advertised for the benefit of the sellers or advertisers	0.142	−0.206	0.084	***0.574***	0.165	−0.021	−0.088
	My mood, e.g. happy, sad, stressed, etc.	0.196	0.226	0.018	***0.538***	0.110	0.027	−0.075
	The fact that healthy food will help me concentrate on my work and avoid accidents and injuries	−0.331	0.020	0.064	***0.521***	0.104	−0.182	−0.092
	What my friends choose for us to eat	0.104	0.276	0.011	***0.483***	−0.036	0.075	0.213
	The need to belong to a particular social group	0.002	0.114	−0.068	***0.471***	0.013	−0.112	0.248
	Social media and networking	0.315	0.277	0.032	***0.471***	−0.102	−0.034	0.005
	My belief that avoiding meat will keep me healthier	0.204	−0.163	0.080	***0.448***	−0.278	−0.188	0.313
	My belief that killing animals for food is not good	0.328	−0.047	0.159	***0.429***	−0.106	0.043	0.268
	My belief that my current diet is adequate	0.072	−0.066	0.258	***0.358***	−0.114	−0.081	0.093
Economic factors	The cost/price of the food	0.049	−0.168	0.074	0.118	***0.845***	0.051	−0.127
	the foods available	0.062	0.074	−0.014	−0.249	***0.729***	−0.198	0.100
	The wages I am paid/income I make	−0.254	0.069	0.005	0.079	***0.636***	−0.154	0.233
	The foods on special offers or discounts	0.333	0.122	0.006	0.204	***0.464***	0.190	0.011

(Continued)

Table 3: (Continued)

Constructs	Measures	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Resources	The facilities on site for storing and heating up my food	0.466	0.034	−0.100	0.106	0.041	***−0.633***	−0.065
	The eating facilities provided on site, e.g. benches, tables, washing bowls/sinks, etc.	0.355	0.033	0.074	0.120	0.042	***−0.616***	−0.026
	What I know my body needs for my current health status	0.174	0.036	0.237	−0.080	−0.071	***−0.564***	0.138
	What I know my body needs at my age	−0.114	−0.048	0.151	0.100	−0.062	***−0.558***	0.300
	The fact that healthy food will help increase my productivity at work	−0.188	0.131	0.055	0.073	0.232	***−0.525***	−0.112
	What I know my body size needs	0.144	−0.175	0.212	−0.059	0.074	***−0.413***	0.263
	My idea that I will add or lose weight with particular foods	0.047	0.173	−0.131	0.298	0.110	***−0.318***	0.020
Cultural distinctions	What I know I should eat as a man or woman	0.202	0.035	−0.002	−0.011	0.014	0.003	***0.652***
	What I know my body needs for the type of work I do	−0.222	0.232	0.109	−0.059	0.091	−0.062	***0.560***
	My belief that I should only eat food from my culture	0.109	0.027	0.049	0.396	0.015	0.022	***0.515***
	My belief that avoiding meat will save money	0.251	−0.206	−0.252	0.367	−0.097	−0.138	***0.427***
Eigen value		10.68	4.15	2.88	2.24	1.88	1.82	1.59
% variance explained by each factor		25.43	9.87	6.85	5.34	4.48	4.33	3.79
Cumulative %		25.43	35.30	42.15	47.49	51.97	56.30	60.09

Note: Items in bold italics show loading on each factor after extraction.

Table 4: Cronbach's alpha and mean inter-item coefficients of the seven-factor solution

Factor		Alpha values	Mean inter-item correlations	Number of items
1	Food context	0.850	0.487	6
2	Biological factors	0.817	0.428	6
3	Nutritional knowledge	0.623	0.304	4
4	Personal ideas and systems	0.841	0.341	10
5	Economic factors	0.740	0.430	4
6	Resources	0.797	0.357	7
7	Cultural background	0.713	0.379	4

does not align with the nine-factor model of food-choice motives (including health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concern), which was developed in a foundation study.[15]

The results of the current study demonstrate that items in the questionnaire seemingly have good and acceptable internal consistency and validity in measuring what they were intended to measure amongst the subjects.

Conclusion

Research on the factors influencing the food choices of construction workers has hardly been conducted in South Africa. More importantly, whether the factors examined for workers in general and the world over can be used to assess construction workers' food choices is poorly documented. This study therefore sought to identify, develop and assess the validity and reliability of a scale for assessing construction workers' food-choice factors.

The objectives of the study were therefore met.

Although the study was conducted in only one province of South Africa, the results are generalisable to construction workers in other parts of South Africa. In addition, due to time constraints, only eight construction sites were sampled. Future studies could sample more sites in order to improve the generalisability of results.

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