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Reliability and validation of the scale for measuring exposure to food advertising on social networks and healthy eating style of university professors

Emilio Flores-Mamani[1*], Elsa-Emma Neira-Ponce[2], Jorge Apaza-Ticona[3], Juan Inquilla-Mamani[4], Julián Apaza-Chino[5]

[1,3,4,5]*Universidad Nacional del Altiplano, Perú.*
[2]*Universidad Nacional San Agustín de Arequipa, Perú.*

Corresponding author: Emilio Flores-Mamani (*Email: emilioflores@unap.edu.pe*)

Abstract

Healthy eating is important to prevent non-communicable diseases that plague modern societies. The objective of the study was to validate the reliability of the instrument for measuring the association between exposure to food advertising on social networks and the healthy eating style of university professors. The method used was quantitative, cross-sectional, and descriptive correlational, with a sample of 210 participants randomly selected from the three professional training areas of the Universidad Nacional del Altiplano - Perú, such as Social Sciences, Engineering, and Biomedical Sciences. The instrument was validated through exploratory factor analysis and Cronbach's alpha coefficient. The results show that the measurement scale is made up of three rotated factors, which explain 56.981% of the variance. The total Cronbach's alpha was 0.760, the Bartlett's test of sphericity was significant (1149.915; df = 120, sig = 0.001), and the Kaiser-Meyer-Olkin value was 0.807. It is concluded that the measurement instrument is reliable for measuring association studies of these variables, so it can explain the behavior of the phenomenon.

Keywords: Food advertising, healthy eating, instrument reliability, social media, scale.

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1. Introduction

In the university context, professors not only fulfill an academic function but also play a formative and exemplary role in front of their students. Their eating behavior can directly or indirectly influence the institutional health culture. Therefore, understanding how exposure to food advertising on social networks impacts their food decisions becomes relevant for promoting healthy habits in the university community.

Healthy eating is important for a healthy life, which means eating low-fat foods, fruits, vegetables, and changing your lifestyle [1]. For this case, the development of new technologies and innovative applications such as social networks has provided new possibilities for advertising and marketing, with personalized ads [2]. In this context, advertising has adapted to technological changes, networks and applications for new, more active forms of communication, making them content generators with much greater access to information [3]. Advertising in these media offers flexibility to advertisers, allowing them to activate and deactivate ads or change their content in near real time [4]. The use of social networks such as Facebook, Instagram or TikTok has spread significantly among university professionals, which increases their exposure to food-related advertising content [5]. This situation can have direct effects on their daily food choices, even in groups with academic training in areas unrelated to nutrition. However, there is no instrument that can measure the phenomenon of the influence of food advertising on social networks on the healthy eating of university professors.

Some studies, such as healthy eating habits were measured according to the degree of adherence to common dietary guidelines for Koreans with 11 items, which detail the basic rules for a desirable diet. The overall model of this study explained 21,6% of the variance in healthy eating habits, of which 16,5% was explained by cooking practices [6]. The validation of the Acquired Healthy Lifestyle Scale (E-VEVSA) was carried out in Spanish adults [7]. To this end, statistical tests were carried out using Cronbach's Alpha and exploratory factor analysis with oblique and confirmatory rotation with varimax, resulting in an instrument structured in seven dimensions and with 52 items. The total variance explained 66,87 % and a Cronbach's alpha of 0,894 was obtained [8].

Despite the amount of literature on the impact of food advertising on social networks, there is a limited availability of validated instruments that allow measuring this phenomenon specifically in populations such as university professors. The validation of a reliable instrument will enable the collection of relevant data for future institutional interventions and policies in the field of health. In this way, any study with scientific validity should have reliable instruments to collect and analyze data based on healthy lifestyles and that also allow differentiation after interventions [9].

Therefore, the validation of this instrument will allow the development of more accurate diagnoses and the adaptation of food education strategies aimed at university professors, which can have a multiplier effect on the promotion of healthy lifestyles within higher education institutions. This type of standardized questionnaire is necessary in the evaluation of people's eating behavior [7].

The objective of this article is to validate the reliability of the instrument for measuring the influence of food advertising on social networks on the healthy eating habits of university professors at the Universidad Nacional del Altiplano, Perú.

2. Methodology

The construct studied in this research refers to the influence of food advertising on social networks on the healthy eating habits of university professors. This is understood as an interaction between digital advertising messages to which people are exposed on platforms such as Facebook, Instagram, or TikTok, and their practices, knowledge, and attitudes related to healthy eating. In this sense, it is based on the premise that digital food advertising can impact food choices, even in populations with a high level of education, such as university professors.

To establish the dimensions of the measurement instrument, a theoretical and empirical review of previous research on food advertising in digital environments and on the factors that shape a healthy diet was carried out. This allowed for the identification of the following sections: food advertising on social networks with 9 items, healthy eating style with 7 items, and healthy lifestyle with 6 items. After the factor analysis, the following were converted into dimensions/factors: 1) healthy eating with 5 items, 2) healthy food advertising with 7 items, and 3) advertising on social networks with 4 items.

2.1. Study Design

A quantitative, descriptive and cross-sectional study was carried out by Hernández et al. [10] aimed at analyzing the relationship between exposure to food advertising on social networks and the eating styles of professors at the Universidad Nacional del Altiplano. This approach allowed the identification of underlying patterns and structures through the use of exploratory factor analysis.

2.2. Population and Sample

The study population was composed of 1200 professors from the three areas of professional training of the Universidad Nacional del Altiplano - Perú: Social Sciences, Engineering, and Biomedicine. A non-probabilistic random sample of 210 participants was selected [11]. This size is suitable for most descriptive and psychometric analyses of the items, as long as the test to be validated is not too extensive [12]. Participants in the study were men and women of the following age ranges: a) under 30 years old, b) 30 to 40 years old, c) 41 to 50 years old, and d) 50 years old and older.

2.3. Data Collection Instrument

To collect the data, each dimension was operationalized using Likert-type items, adapted to the context of university professors. To guarantee the validity of the content, the instrument was submitted to the judgment of experts in communication and nutrition, who were given the consistency matrix, the instrument, and the validation format for each item, in order to receive suggestions, which were considered in the final instrument. Subsequently, a pilot test was applied and a reliability analysis was carried out using Cronbach's Alpha coefficient, with the aim of validating the internal consistency of the instrument, whose result was 0.760 and is acceptable [13].

The selection of items involves clearly and exhaustively defining the construct to be measured, and from that definition, choosing the items that address all the relevant aspects of that construct [12]. The scale used for the instrument was 1 = never;

2 = almost never; 3 = sometimes; 4 = almost always; 5 = always. When the items to be analyzed are polytomic, Likert scale type, it is recommended to use items with at least five response alternatives and with approximately normal distributions [14]. In this way, having an instrument that has validity and reliability is essential to quickly and objectively identify the risk factors and prognosis of people's lifestyles [15].

2.4. Procedures

The questionnaire was applied in the facilities of the faculties of Universidad Nacional del Altiplano during the months of September and October 2024. The collected data were emptied to Excel and then the factor analysis was performed, where its main purpose is to try to establish an underlying structure between the variables of the analysis, based on correlation structures between them, in other words, it seeks to define groups of variables (better known as factors/dimensions) that are highly correlated with each other [16]. Data was analyzed using SPSS statistical software. The following stages of analysis were carried out:

- *Descriptive analysis of the demographic part***:** To characterize the profile of the participants and evaluate the distribution of the responses.
- *Exploratory factor analysis*: The principal component method with varimax rotation was used to identify underlying factors in eating styles and exposure to advertising on social networks. The Kaiser-Meyer-Olkin (KMO) criteria and the Bartlett's sphericity test.
- *Instrument reliability tests after factor analysis:* Cronbach's alpha was calculated to assess the internal consistency of the scales [17, 18].

2.5. Ethical Considerations

The study was approved by the ethics committee of the Universidad Nacional del Altiplano, following the principles of confidentiality and informed consent. Participants received information about the study and decided to participate voluntarily.

3. Results

Table 1 shows the participation of professors in the study, where 2.9% are under 30 years old, 16.8% are between 31 and 40 years old, 35.6% are 41 to 50 years old, and 44.7% are over 50 years old. In addition, of the general total, 43.8% corresponds to the female gender and 56.3% to the male gender. Of the 100% of participants in the area of social sciences, 42.7% were female and 57.3% male. From the engineering area, 36.1% were female and 63.9% male. Of the biomedical participants, 56.8% were female and 43.2% male. The majority of participants in the overall total were aged 41 to 50 years (35.6%) and 44.7% were over 50 years of age. The participation of these professors has made it possible to analyze and determine the factors that would influence the eating style of university professors.

Table 1.
Cross table: Gender, Age and Area of professional training

Vocational Training Area				**Age**				**Total**
				under 30 years old	**31 to 40 years old**	**41 to 50 years old**	**More than 50 years**	
Social sciences	Gender	Female	Recount	3	9	19	13	44
			% of total	2.9%	8.7%	18.4%	12.6%	42.7%
		Male	Recount	2	4	21	32	59
			% of total	1.9%	3.9%	20.4%	31.1%	57.3%
	Total		Recount	5	13	40	45	103
			% of total	4.9%	12.6%	38.8%	43.7%	100%
Engineering	Gender	Female	Recount	0	5	11	6	22
			% of total	0.0%	8.2%	18.0%	9.8%	36.1%
		Male	Recount	1	6	11	21	39
			% of total	1.6%	9.8%	18.0%	34.4%	63.9%
	Total		Recount	1	11	22	27	61
			% of total	1.6%	18.0%	36.1%	44.3%	100%
Biomedical	Gender	Female	Recount		8	9	8	25
			% of total		18.2%	20.5%	18.2%	56.8%
		Male	Recount		3	3	13	19
			% of total		6.8%	6.8%	29.5%	43.2%
	Total		Recount		11	12	21	44
			% of total		25.0%	27.3%	47.7%	100%
Total	Gender	Female	Recount	3	22	39	27	91
			% of total	1.4%	10.6%	18.8%	13.0%	43.8%
		Male	Recount	3	13	35	66	117

			% of total	1.4%	6.3%	16.8%	31.7%	56.3%
	Total		Recount	6	35	74	93	208
			% of total	2.9%	16.8%	35.6%	44.7%	100%

3.1. Exploratory Factor Analysis

In Table 2, the result of the Bartlett's sphericity test was significant (1149.915, df = 120, sig = 0.001), suggesting that the correlation matrix differs from the identity matrix. In addition, the Kaiser-Meyer-Olkin value was 0.807, which is considered adequate for factor analysis [19].

Table 2.
KMO and Bartlett Test.

Kaiser-Meyer-Olkin measure of sampling adequacy		0.807
Bartlett's sphericity test	Approx. Chi-square	1149.915
	Df	120
	Sig.	0.000

Table 3 shows that when performing the exploratory factor analysis (EFA), a final solution was obtained with eigenvalues greater than 1, which show 3 rotated factors that explain 56.981% of the variance. Thurstone proposed that the factors be rotated in a multidimensional space to obtain the solution with the simplest structure. Factorial rotation can be orthogonal or oblique. The orthogonal method assumes that the factors are independent [20]. For the present study, varimax rotation was used because it presented low correlations.

Table 3.
Total variance explained.

Component	**Initial eigenvalues**			**Sums of loads squared of extraction**			**Sums of charges squared of rotation**		
	Total	**% variance**	**Cumulative %**	**Total**	**% variance**	**Cumulative %**	**Total**	**% variance**	**Cumulative %**
1	3.812	23.828	23.828	3.812	23.828	23.828	3.280	20.501	20.501
2	3.272	20.451	44.278	3.272	20.451	44.278	3.245	20.281	40.782
3	2.032	12.703	56.981	2.032	12.703	56.981	2.592	16.199	56.981
4	.868	5.426	62.407						
5	.806	5.037	67.444						
6	.749	4.680	72.124						
7	.677	4.231	76.355						
8	.622	3.885	80.240						
9	.549	3.432	83.672						
10	.494	3.090	86.762						
11	.456	2.852	89.614						
12	.444	2.776	92.390						
13	.360	2.248	94.638						
14	.306	1.914	96.552						
15	.289	1.808	98.360						
16	.262	1.640	100.000						

Extraction method: principal component analysis.

Table 4 shows three factors with their respective rotated factor loads; these loads are greater than 0.40. This means that the reagents contribute better and reduce the risk of overfitting that may have occurred when eliminating the items. In this way, item selection is used to assess the internal consistency of the scales [21]. Likewise, according to these authors, the studies reviewed point to a minimum of 3 or 4 items per factor, only if a minimum of 200 cases are available. In the present study, the items per factor are greater than three.

Table 4.
Rotated Component Matrix[a].

	Factor load		
	Healthy eating	**Healthy Food Advertising**	**Social Media Advertising**
I follow a healthy diet in my daily life.	0.832		
I regularly eat fresh, healthy foods.	0.826		
In my daily diet, I consider fruits and vegetables.	0.809		
In my diet, I consider the cereals of the region (quinoa, barley, etc.).	0.782		
One of the foods I like the most is beans.	0.520		
Social media advertising influences my healthy lifestyle decisions (diet, exercise, etc.).		0.793	
Advertising for healthy foods has influenced my diet.		0.770	
Food advertising on social media influences my food choices.		0.757	
Social networks advertise the consumption of natural drinks. which motivates me to consume them.		0.678	
I consider that advertising on social networks affects my perception of what healthy food is.		0.655	
I do physical activity on a regular basis.	0.430	0.442	
Food advertising on social media can be seen constantly.		0.415	
I use social media daily.			0.788
I spend more than 2 hours a day on social media.			0.753
I frequently see advertisements on social media.			0.750
Social networks allow you to keep up with the news.			0.718
Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization.			
a. The rotation has converged in 4 iterations.			

Table 5 shows the calculation of the total reliability of the scale. For internal consistency, Cronbach's alpha coefficient was used to calculate from the covariance between them. The alpha value determined as valid had to exceed 0.70 [22]. The Cronbach's alpha result of the proposed measurement instrument was also 0.760, which means that the measurement scale formulated turns out to be reliable to measure similar phenomena, leaving 16 items, having eliminated item 6.

Table 5.
Reliability Statistics.

Cronbach's alpha	N of elements
0.760	16

4. Discussion

The result of our scale was a reliable instrument with psychometric properties, for which 210 subjects aged 30 to over 50 years were studied. The analysis of the general validation of the construct based on Cronbach's Alpha statistic was performed, whose result was greater than 0.7, and the exploratory factor analysis with varimax rotation, where the main components explained 56.981% of the total variance, which resulted in an instrument with 16 items structured in three factors or dimensions: 1) The healthy eating dimension with six items, 2) healthy food advertising with seven items, and 3) advertising on social networks with four items.

In the background information reviewed, there are no validated measurement scales on exposure to advertising healthy foods on social networks and healthy eating among adults in the university context, but they are only partially related because previous studies are univariate, that is, only the healthy eating variable or, in some cases, the relationship with other variables. The validation of the Acquired Healthy Lifestyle Rating Scale (E-VEVSA) was carried out in Spanish adults; 248 people aged 22 to 72 years participated, and 52 items were administered, obtaining a reliability of 0.876. The result of exploratory factor analysis revealed a structure of seven factors: 1) Individual responsibility in health care, 2) Physical-sports practice habits, 3) Health habits in social relationships, 4) Tobacco and alcohol consumption habits, 5) Healthy eating habits, 6) Psychological health habits, and 7) Daily rest and sleep habits. With this study, there is agreement on the healthy eating habits factor of Spanish adults. Likewise, the healthy lifestyle instrument (CEVS) was structured, made up of four factors with acceptable values of reliability, which coincide with our scale, with the physical/mental factor, which includes items on healthy eating [23].

On the other hand, our scale is related to some items of the instrument that were validated in the questionnaire of the eating behavior of adult adolescents with a sample of 636 subjects, with 35 items grouped into 8 factors: hunger with 5 items, food sensitivity with 4 items, emotional overeating with 5 items, enjoying food with 3 items, sensitivity to satiety with 4 items, not eating emotionally with 5 items, emotional insatiability with 5 items, preoccupation with food with 5 items, and slowness when eating with 4 items [7]. The results revealed a 7-factor solution, with the hunger factor eliminated, which gave an adequate overall fit of the model ($\chi 2 = 896.86$; CFI = 0.924; TLI = 0.912; RMSEA = 0.05 (90% CI: 0.043; 0.051);

SRMR = 0.06). In the same way, it is related to some items of the components of the instrument validated to measure the medical student lifestyle [24], where the scale had 13 factors and 47 items, which explained 56.7% of the total variance. The factors were grouped as follows: physical activity with a reliability coefficient of 0.84, mental health 0.83, consumption of processed foods and unhealthy internet use 0.79, harmful health habits 0.75, consumption of dairy products and natural probiotics 0.72, eating patterns 0.57, depressive symptoms 0.82, self-care activities 0.62, fruit consumption and being vegetarian 0.54, sleep hygiene 0.40, safe behaviors 0.20 of reliability, and dental care and other eating habits that obtained statistically invalid results [7].

Thus, the literature does not show measurement scales on the relationship of the variables referred to in the context of the university professor. Whereas, food, in a broad sense of its meaning, defines people's health, as well as their growth and development [25]. The daily intake of food must consider macro and micronutrients to meet the physiological needs of the human being. A healthy diet is essential to preserve health and prevent various diseases. To do this, it must be balanced and diverse, providing the appropriate nutrients according to the age, sex, physical condition and health status of each individual [26]. Therefore, this instrument will be useful to measure the influence of food advertising on social networks on the healthy eating of university professors and, in general, especially to prevent certain diseases that can affect professors as a result of a poor diet.

The limitations of the study are that they were only applied to subjects from one institution and not to other nationalities or foreigners. In addition, the sampling design was random without stratification; likewise, the literature does not provide further information on the dimensions, so its extrapolation would be of lesser scope.

5. Conclusions

The results of the research on the validation of the measurement scale have been composed of three factors or dimensions: healthy eating, advertising of healthy foods, and advertising on social networks. This instrument, a product of exploratory factor analysis, is considered valid and useful for mediating the constructs of the influence of food advertising on social networks and the healthy eating style of university professors, in such a way that it will allow for the explanation of similar events.

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