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Validity and Reliability of the Climate Change Awareness Scale in Turkish Adults

İklim Değişikliği Farkındalık Ölçeğinin Türk Yetişkinlerde Geçerlik ve Güvenilirlik Çalışması

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ABSTRACT Objective: Climate change is a global problem and it is more essential to measure and increase awareness of climate change. The aim of this study was to evaluate the validity and reliability of the Turkish Climate Change Awareness Scale for Adults (CCA-A). **Material and Methods:** The exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) analyses were conducted with 198 and 220 participants, respectively and total sample was 418. The survey form provided to the participants consisted of sociodemographic data, anthropometric measurements, the Climate Change Awareness Scale and the Sustainable Nutrition and Behavior Scale. Cronbach's alpha and split-half coefficients were calculated as internal consistency analyses to assess the reliability of the scale. **Results:** The factor loadings of the scale items between 0.418 to 0.945, and the percentage explaining the overall variance was found to be 55.73%. The EFA indicated that the scale items were 2 separate subscales. The CFA analysis revealed the following results for the CCA-A scale: χ^2/SD=2.665, Goodness of Fit Index=0.95, Comparative Fit Index=0.918, and Root Mean Square Error of Approximation=0.077. The reliability analysis showed a Cronbach's alpha value of 0.82, the Spearman Brown value of 0.91, and the Guttman value of 0.89 for the CCA-A total scale. Furthermore, a statistically significant positive correlation was found between the scale and the Sustainable and Healthy Eating Behaviors Scale (r=0.169; p<0.05). **Conclusion:** In conclusion, the CCA-A is a validity and reliable scale for assessing the level of awareness of climate change among adults.

Keywords: Climate Change Awareness Scale; climate change awareness; sustainability

ÖZET Amaç: İklim değişikliği küresel bir sorundur ve iklim değişikliğine ilişkin farkındalığın ölçülmesi ve artırılması daha önemli hale gelmektedir. Bu çalışmanın amacı, Yetişkinler için İklim Değişikliği Farkındalık Ölçeği'nin [Climate Change Awareness Scale for Adults (CCA-A)] geçerlik ve güvenilirliğini değerlendirmektir. **Gereç ve Yöntemler:** Araştırma toplam 418 katılımcı üzerinde yürütülmüş ve Açımlayıcı Faktör Analizi (AFA) ve Doğrulayıcı Faktör Analizi (DFA) analizleri sırasıyla 198 ve 220 katılımcı ile gerçekleştirilmiştir. Katılımcılara verilen anket formu sosyodemografik veriler, antropometrik ölçümler, İklim Değişikliği Farkındalık Ölçeği ve Sürdürülebilir Beslenme ve Davranış Ölçeği'nden oluşmaktadır. Ölçeğin güvenilirliğini değerlendirmek için iç tutarlılık analizleri olarak Cronbach's alfa ve split-half katsayıları hesaplanmıştır. **Bulgular:** Ölçek maddelerinin faktör yükleri 0,418 ile 0,945 arasında değişmekte olup, genel varyansı açıklama yüzdesi %55,73 olarak bulunmuştur. AFA, ölçek maddelerinin 2 ayrı alt boyuttan oluşmaktadır. DFA analizi, CCA-A ölçeği için şu sonuçları ortaya koymuştur: χ^2/SD=2,665, İyilik Uyum İndeksi [Goodness of Fit Index (GFI)]=0,95, Karşılaştırmalı Uyum İndeksi [Comparative Fit Index (CFI)]=0,918 ve Tahmin Hatalarının Ortalamasının Karekökü [Root Mean Square Error of Approximation (RMSEA)]= 0,077. Güvenilirlik analizi, CCA-A toplam ölçeği için Cronbach alfa değerinin 0,82, Spearman Brown değerinin 0,91 ve Guttman değerinin 0,89 olduğunu göstermiştir. Ayrıca, ölçek ile Sürdürülebilir ve Sağlıklı Beslenme Davranışları Ölçeği arasında istatistiksel olarak anlamlı pozitif bir korelasyon bulunmuştur (r=0,169; p<0,05). **Sonuç:** Sonuç olarak, CCA-A yetişkinler için iklim değişikliğine ilişkin farkındalık düzeyini değerlendirmek için geçerliliği ve güvenilirliği olan bir ölçektir.

Anahtar Kelimeler: İklim Değişikliği Farkındalık Ölçeği; iklim değişikliği farkındalığı; sürdürülebilirlik

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Climate change is related to permanent changes in temperature and meteorological phenomena.[1] Climate change has been referred to as the most significant worldwide health hazard of the 21st century.[2] As to the definition provided by the UN Framework Convention on Climate Change, climate change refers to alterations in the global atmosphere's composition caused by human activity, along with the natural variability of climate observed over similar time periods.[3] The impacts of natural causes of climate change are worsened by human-driven, ecologically destructive processes and actions.[4]

During the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change, held in November 2022, it was announced that the world is anticipating a crucial period for taking action on climate change. It was emphasized that global greenhouse gas emissions must be decreased by 2025 at the latest in order to restrict global warming to around 1.5°C. According to reports, efforts should be made to prevent it from reaching its maximum level and decrease it by 43% by the year 2030.[5] The raising global temperatures, alterations in rainfall distribution, and heightened intensity of heat waves and frequency of extreme weather occurrences are having detrimental effects on multiple systems that are crucial for optimal nutrition, including food production, dietary consumption, health, social welfare, and water/hygiene.[6] Climate change has adverse effects on both the environment and human well-being, with certain populations that are already disadvantaged experiencing a greater burden of these repercussions.[7]

The climate crisis is primarily caused by the exponential growth in human use of natural resources to meet rising standards of living, population growth, increasing energy consumption and a shift in dietary patterns towards greater consumption of animal products.[8] Based on the 2019 EAT-Lancet report, nutrition have a crucial role in enhancing human health and promoting environmental sustainability on a global scale. However, the current availability of global nutrition poses a significant risk to both individuals and the earth. To enhance both human and planetary well-being, it is imperative to adopt sustainable nutritional systems that can mitigate the climate problem. The EAT-Lancet Commission Panel established the Planetary Health Diet within sustainable nutrition models, which primarily consists of whole grains, vegetables, fruit, nuts, legumes, and unsaturated fats. It also includes moderate or small portions of fish and poultry, while reduction the consumption of red meat or processed meat, added sugars, highly processed foods, refined cereals, and starchy vegetables.[9] A study showed that a higher adherence to the Planetary Health Diet might result in a 50% decrease in food-related greenhouse gas emissions and a 62% reduction in land use.[10] Furthermore, plant-based diets characterized by diminished meat intake have demonstrated efficacy in lowering greenhouse gas emissions and optimizing the utilization of land, energy, and water resources.[11] In order to adopt sustainable nutrition models, it is imperative to acknowledge the direct and substantial influence of nutrition and nutrients on climate change.

Over the past few years, there has been a important increase in public awareness regarding the impact of human activities on climate change. Furthermore, there is an increasing recognition of the potential impact on individuals.[12] Considering the global effects of climate change; it has been reported that it is important to evaluate knowledge, attitudes and awareness about climate change.[13] Thus, the aim of this study was to evaluate the validity and reliability of the Climate Change Awareness (CCA) Scale for high school students, developed by Gönen et al. 2023, in the Turkish adult population.[14]

MATERIAL AND METHODS

STUDY DESIGN AND PARTICIPANTS

This study is a metadological study evaluating the validity and reliability of the CCA Scale in Turkish adults. The study was carried out with a web-based face-to-face interview method, with 418 individuals, from March 2024 to May 2024. The study included adult participants between the ages of 19 and 64 who had adequate communication skills and were able to answer the survey questions. Illiterate individuals were excluded from the study. Before the commencement of the research, participants were required to provide their assent by signing an informed

consent form, confirming their voluntary participation in the study.

MEASUREMENT TOOLS

The survey form provided to the participants consisted of sociodemographic data, anthropometric measurements, the CCA Scale, and the Sustainable Nutrition and Behavior Scale.[14,15]

The CCA Scale

In 2023, Gönen et al. developed the CCA Scale specifically designed for high school students.[14] The scale comprises 2 subscales: Reasons of Climate Change, which consists of 12 items, and Recklessness Act to Climate Change, which consists of 5 items. In total, the scale contains 17 items. The CCA scale is assessed on a 5-point Likert scale: "strongly disagree" (1), "disagree" (2), "neutral" (3), "agree" (4), and "totally agree" (5). The original form of the CCA is given in the supplementary material.

Sustainable and Healthy Eating Behaviors Scale

The Sustainable and Healthy Eating Behaviors Scale was originally developed by Zakowska-Biemans et al., and a Turkish version of the scale was subsequently published by Köksal et al.[15,16] The scale comprises 7 subscales and 32 items. The scale's subscales assess the quality labels for regional and organic products, the consumption of seasonal food and efforts to reduce food waste, the promotion of animal welfare, the decrease of meat consumption, the adherence to a healthy and balanced diet, the support for local food, and the emphasis on low fat content. The evaluation is conducted using a Likert scale, with scores ranging from 1 to 7. Each factor and the overall score are determined based on the following scale: "never" (1), "very rarely" (2), "rarely" (3), "sometimes" (4), "often" (5), "very often" (6), "always" (7). An elevation in the overall score signifies a rise in the degree of sustainable and healthful dietary habits.

RELIABILITY AND VALIDITY ANALYSIS

Assessment of Construct Validity

The Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) are employed to assess the construct validity of scales.[17] The EFA is conducted to ascertain the factor structure of the scale items.[18] The CFA is a method used to assess the relationship between factors, measurements, items, or test scores in order to determine the desired structure. Confirmatory factor analyses are useful for improving the identification of undetectable variables.[19]

The EFA analysis should be applied to at least 5-10 times the number of items, and the analysis was carried out with 198 participants.[17] It is recommended to do the CFA analysis on a different sample from the one used for the EFA analyses. Therefore, CFA analyses were conducted on 220 participants using a separate data set.

Prior to conducting factor analyses to assess the construct validity of measuring instruments, researchers employ Kaiser-Meier-Olkin (KMO) analysis to evaluate the sufficiency of the sample size, and Bartlett's sphericity test to ascertain the presence of correlations among the items. A scale must meet 2 criteria to be appropriate for factor analysis: its KMO value must exceed 0.60, and the result of the Bartlett sphericity test must be statistically significant ($p<0.05$).[20] The acquired data was evaluated for its eligibility for the EFA using KMO and Bartlett sphericity tests. Secondly, the factor loading value represents the coefficient that elucidates the link between items and factors. Items are anticipated to possess elevated values within the components in which they are incorporated. It demonstrates that objects with high factor loadings are part of a shared structure. A variable with a factor load below 0.3 is considered to have a low load value, whereas a factor load between 0.30 and 0.59 indicates a medium load value. A factor load of 0.60 or more indicates a high load value.[21]

Finally, the CFA evaluates a scale's model goodness of fit values. Within the framework of the CFA, we examined the following multiple fit indices: chi-square/degrees of freedom (x2/df) ratio, Square Error of Approximation (RMSEA), Standardised Root Mean Square Residual (SRMR), Goodness of Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Comparative Fit Index (CFI), and Normed Fit Index (NFI). In the CFA, $\chi 2/df \leq 3.0$, $RMSEA \leq 0.05$, $SRMR \leq 0.05$, $GFI \geq 0.90$, $AGFI \geq 0.95$, $CFI \geq 0.95$, $NFI \geq 0.95$ indicate good fit, and $3 \leq \chi 2/df \leq 5$, $0.05 \leq RMSEA \leq 0.08$,

0.80≤GFI≤0.90, 0.85≤AGFI≤0.95, 0.85≤CFI≤0.95, and 0.80≤NFI≤0.95 indicate acceptable fit according to conventions for Model Confirmatory Factor Analysis Fit Indices.[22]

Assessment Of Reliability

Internal consistency refers to the degree to which the items on a scale measure the same notion or structure.[23] The Cronbach's alpha (α), developed by Lee Cronbach in 1951, is a statistical measure used to assess the internal consistency of an instrument or test. The Cronbach's α coefficient ranges from 0 to 1.[24] The Cronbach's α is frequently used as a measure to assess the internal consistency of a test. A reliability score of 0.7 or above is considered acceptable.[25] An alternative measure of internal consistency reliability, the split-half coefficient, can be used to assess the reliability of the scale. This principle is founded on the act of partitioning the scale into 2 distinct parts. The Spearman-Brown formula computes the reliability coefficient by dividing the scale, and a measurement tool is considered reliable if the coefficient is greater than 0.70.[26]

ETHICAL APPROVAL

Project approval for this study was obtained from the Selçuk University Non-Interventional Clinical Research Ethics Committee (date: 28 February 2024; no: 12/275) and the principles of the Declaration of Helsinki were taken into consideration.

DATA ANALYSIS

Statistical analyses were conducted with SPSS software version 26.0. The CFA was conducted using AMOS software version 26.0. The data was evaluated using descriptive statistics, including measures such as mean, standard deviation, number, and percentage. The Spearman correlation coefficient was used to analyze the relationships between the scales. Fit indices and p values were reported with 3 decimal points to enhance precision. The statistical significance level was set at $p<0.05$.

RESULTS

The sociodemographic characteristics of the participants (age, gender, marital status, education level), nutritional patterns, smoking and alcohol use, anthropometric measurements (body weight, height) and Body Mass Index (BMI) values calculated from these measurements are given in Table 1. The average age of the participants is 32.5±11.96 and 63.2% are women. It is also seen that almost all of the participants are omnivorous.

Validity analyses were conducted for the CCA Scale for Adults (CCA-A) scale. Subsequently, it was discovered that the items could be categorized, leading to the execution of the EFA and CFA for the items. The KMO value for CCA-A was determined to be 0.865, indicating a high level of sampling adequacy. Additionally, the Bartlett Sphericity Test yielded a statistically significant result (p=0.000), suggesting that the variables in the analysis are correlated. The study determined that the sample size for CCA-A was adequate and the items were appropriate for factor analysis. The validity investigation resulted in a criteria of 0.40 for the factor loadings in the EFA of CCA-A. The item factor loading ranged

TABLE 1: Demographic information of the participants

		Total Sample (n=418) n (%) or $\bar{X}$±SD
Age (mean±SD)		32.5±11.96
Sex	Female	264 (63.2%)
	Male	154 (36.8%)
BMI (kg/m^2)		24.2±4.45
	Underweight	24 (5.8%)
	Normal	233 (55.7%)
	Overweight	118 (28.2%)
	Obese	43 (10.3%)
Education	High School	55 (13.1%)
	Bachelor degree	282 (67.5%)
	Master/doctorate degree	81 (19.4%)
Marital Status	Married	190 (45.5%)
	Single	228 (54.5%)
Nutrition Model	Omnivor	398 (95.2%)
	Semi-Vegetarian	15 (3.6%)
	Vegetarian-Vegan	5 (1.2%)
Physical activity	Yes	107 (25.6%)
	No	311 (74.4%)
Smoking	Yes	105 (25.1%)
	No	313 (74.9%)
Alcohol Use	Yes	83 (19.9%)
	No	335 (80.1%)

SD: Standard deviation; BMI: Body Mass Index

TABLE 2: Items and EFA factor loading in CCA Scale for adults

Items		Eigen value	Total variance %	Factor loadings Factor 1 RA	Factor 2 RE
RE7	I am aware that N2O from gasoline or engine used in vehicles increases global warming	5.23	30.76	0.801	
RE6	I am aware that most of the human-induced CO2 emissions are caused by the use of fossil derived fuels			0.756	
RE11	I would like to improve my knowledge on combating climate change			0.702	
RE5	I am aware that floods will occur if the temperature of the world increases			0.689	
RE3	I am aware that the warm weather in autumn months lasts longer each year			0.673	
RE9	I am aware thar CO2 and CH4 gases are natural greenhouse gases			0.673	
RE12	As long as it is derived from fossil fuels, I am aware of that less energy consumption slows down global warming			0.663	
RE10	I'm worried about energy waste			0.654	
RE4	I'm amazed by people who are unaware of how dangerous climate change is			0.644	
RE2	I am aware of that the difference between climate change in nowadays and climate change in the natural process is realized by human impact			0.600	
RE1	Permanent changes in the habitats of animal communities is one of the consequences of global warming			0.562	
RE8	It will make me happy that due to climate change, new business areas will be created in energy production			0.418	
RA15	I'm not interested in the disappearance of the white polar bears living on the glaciers that disappear due to climate change	4.24	24.97		0.945
RA13	I am not worried about the number of hungry people in various countries of the world due to climate change				0.936
RA14	I do not find the helplessness of the people of the island countries to be inundated by climate change				0.890
RA17	The forecast of sea level to rise permanently is not due to global warming				0.887
RA16	I think that global climate change will not cause drought in my country				0.851
Total		**9.47**	**55.73**		
KMO=0.865; Bartlett Sphericity Test (χ^2=1996.666), (p=0.000)					

EFA: Exploratory factor analysis; CCA: Climate Change Awareness; KMO: Kaiser-Meier-Olkin analysis

from 0.418 to 0.945, indicating that the items achieved the specified factor loading (Table 2).

When the fit model values for the CCA-A scale were examined, it was determined that the model demonstrated an adequate level of fit based on the χ^2/df, AGFI, GFI, CFI, NFI, SRMR, and RMSEA fit index results. The fit statictics results are displayed in Table 3, while the scale model is shown in Figure 1.

In Table 4, evaluated the reliability of the CCA-A scale using Cronbach's alpha value and split-half reliability. The CCA-A total scale had an alpha value of 0.82, a Spearman Brown value of 0.91, and a Guttman value of 0.89.

TABLE 3: Fit statistics of model with CFA

Model fit indices	Acceptable fit index criteria	Good fit index criteria	CCA-A fit indices
χ^2/df	≤5.0	≤3.0	2.665
AGFI	≥0.85	≥0.95	0.905
GFI	≥0.80	≥0.90	0.950
CFI	≥0.85	≥0.95	0.918
NFI	≥0.80	≥0.95	0.926
Standardised-RMR	≤0.08	≤0.05	0.048
RMSEA	≤0.08	≤0.05	0.077

Abbreviations: AGFI: Adjusted Goodness-of-Fit Index; CFI: Comparative Fit Index; GFI: Goodness-of-Fit Index; NFI: Normed Fit Index; RMR: Root Mean Square Residual; RMSEA: Root Mean Square Error of Approximation; χ^2/df: Chi-square/degrees of freedom ratio

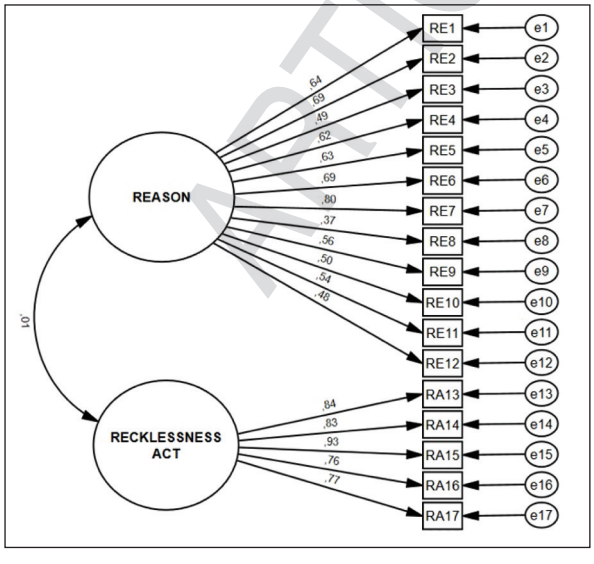

FIGURE 1: Scale modelling of CCA Scale for adults

The correlation between the CCA-A scale and its subscale and the Sustainable and Healthy Eating Behaviors Scale and its subscale are given in Table 5. A statistically significant positive relationship was found between the CCA-A scale and its subscale ($p<0.001$). In addition, a positive, statistically significant relationship was found between the scale and the Sustainable and Healthy Eating Behaviors Scale ($r=0.169$; $p<0.05$).

DISCUSSION

In reaction to the increasing environmental problems globally, governments have developed national and international policies that aim to prevent the impacts of climate change. The current objective is to support climate change adaptation and mitigation policies that contribute to the achievement of global targets.[27] Republic of Türkiye's objective is to mitigate climate change at a national level in order to enhance sustainable food systems.[28] Assessing and enhancing the levels of public awareness on climate change will contribute to global consciousness. This study is an adaptation research designed to evaluate the level of CCA among adults in Turkish society.

In order to determine the construct validity of the measurement tools, the adequacy of the number of samples is analyzed by KMO analysis, and the sample size is tested by the Bartlett sphericity test before factor analyses are performed. The scale must meet two criteria to be appropriate for factor analysis: the KMO value must exceed 0.60, and the result of the Bartlett Sphericity Test must be statistically significant ($p<0.05$).[20] This study determined the KMO value to be 0.86, which is clearly compatible with the literature. These results show that the evaluation tool is appropriate for factor analysis and the number of samples is sufficient. As a result of these analyses, it was found that CCA-A has different dimensions and that these dimensions are sufficient to evaluate the sub-dimensions, and the correlation between items is sufficient. The EFA result categorizes factor loads as follows: values below 0.3 are considered low, values between 0.30 and 0.59 are considered medium, and values of 0.60 and above are considered high.[21] This analysis eliminated items with factor loadings <0.4. As a result of the factor analysis, the scale consists of

TABLE 4: Reliability analysis of Cronbach's alpha and Split-Half of the CCA Scale for adults

	Items	n	Cronbach's alpha	Part1	Part 2	r value$_{1-2}$	Spearman Brown	Guttman
Reasons of climate change	12	220	0.82	0.72	0.55	0.83	0.91	0.89
Recklessness act to climate change	5							
Total	17							

TABLE 5: Correlation between factors of the CCA Scale for adults and factors of the Sustainable and Healthy Eating Behaviors Scale

	CCA-A		RA		RE	
	r value	p value	r value	p value	r value	p value
Sustainable and Healthy Eating Behaviors Scale	0.169*	0.012	0.123	0.068	0.220	0.115
Quality labels	0.119	0.079	0.096	0.156	0.071	0.295
Seasonal food and avoiding food waste	0.183**	0.007	0.155*	0.021	0.101	0.134
Animal welfare	0.299	0.001	0.149*	0.027	0.173**	0.010
Meat reduction	0.047	0.486	0.032	0.639	0.004	0.954
Healthy and balanced diet	0.122	0.071	0.091	0.177	0.800	0.236
Local food	0.017	0.799	0.032	0.639	-0.008	0.907
Low fat	0.228**	0.001	0.113	0.095	0.209**	0.002
CCA-A	1	-	0.713**	0.000	0.696**	0.000
Reasons of climate change			1	-	-0.008	0.903
Reclessness act to climate change					1	-

*p< 0.05, **p< 0.001

2 subscales. The criteria used to determine the factor loadings of the scale items are in line with the existing literatüre. The CFA contributes to the improved identification of latent variables. The adequacy of the model in the CFA analyses is assessed using various fit criteria, including the x^2/df ratio, AGFI, GFI, CFI, SRMR, and RMSEA.[19] As a result of the CFA, χ^2/SD, GFI, CFI, and RMSEA values of the CCA-A scale were 2.665, 0.95, 0.918, and 0.077, respectively. The obtained results reveal that the CCA-A scale's factors possess a structure capable of explaining the original variance, confirming the validity and perfect compatibility of the model with the structure. A Cronbach's α value between 0.81 and 1.00 indicates high reliability, 0.61-0.80 indicates medium reliability, 0.41-0.60 indicates low reliability, and 0.00-0.40 indicates that the scale is unreliable.[29] The study determined the Cronbach's value of the CCA-A scale to be 0.825. These results show that this value is consistent with the literature and that the scale is a reliable measurement tool.

Food consumption is a significant factor in causing environmental problems, and it is recommended that adopting sustainable and healthy eating habits can help reduce the negative impact on the environment and enhance public health.[30] The rapid growth of food systems and human's eating behaviors are currently exerting an extensive pressure on both the environment and human health. It is crucial to move towards more sustainable nutrition models in order to improve both human and planetary health. Typically, sustainable foods are those that are local, unprocessed, plant-based, and seasonal.[31] Scientific evidence demonstrates that food systems that are not suitable of being maintained throughout time, at various points in the process of production, storage, transit, and consumption, have a substantial influence on the release of greenhouse gases. Climate change is a major factor contributing to the decline of biodiversity and the degradation of natural resources.[9] At this point, it appears that enhancing public awareness about climate change will be a crucial step for improving sustainable nutrition behaviors.

CCA levels affect individuals' food choices and nutrition patterns. It is associated with more sustainable nutrition patterns in individuals with a high level of climate change awareness.[32] Increasing levels of CCA lead to an increase in less meat consumption,

seasonal and local food consumption, climate-friendly nutrition, and animal welfare.[33] Bose et al. found that consumers who consume more meat have less knowledge about the relationship between climate and nutrition.[34] Another study found that individuals with higher adherence to the Mediterranean diet, one of the sustainable nutrition models, had higher ecological footprint awareness scores.[35] Our study demonstrated a positive correlation between the CCA-A scale and the Sustainable and Healthy Eating Behaviors Scale. We also found a positive correlation with seasonal food and avoiding food waste, animal welfare, and awareness of the reason of climate change.

LIMITATIONS

This study has some limitations. The research collected data based on individuals' self-reports. Women made up the majority of the research participants, and we observed that their education level exceeded that of the general population.

CONCLUSION

As a result, measuring the level of CCA is an important step for policies to be implemented for society. CCA-A is a valid and reliable scale that measures the level of CCA in adults.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Sümeyra Şahin Bayram, Emine Karademir, Cansu Memiç İnan;* ***Design:*** *Sümeyra Şahin Bayram, Emine Karademir, Cansu Memiç İnan;* ***Control/Supervision:*** *Sümeyra Şahin Bayram;* ***Data Collection and/or Processing:*** *Emine Karademir, Cansu Memiç İnan;* ***Analysis and/or Interpretation:*** *Sümeyra Şahin Bayram, Emine Karademir;* ***Literature Review:*** *Sümeyra Şahin Bayram, Emine Karademir, Cansu Memiç İnan;* ***Writing the Article:*** *Sümeyra Şahin Bayram, Emine Karademir, Cansu Memiç İnan;* ***Critical Review:*** *Sümeyra Şahin Bayram, Cansu Memiç İnan.*

REFERENCES

1. United Nations [Internet]. What is climate change? [Cited: May 13, 2024] Available from: https://www.un.org/en/climatechange/what-is-climate-change
2. Costello A, Abbas M, Allen A, Ball S, Bell S, Bellamy R, et al. Managing the health effects of climate change: Lancet and University College London Institute for Global Health Commission. Lancet. 2009;373(9676):1693-733. Erratum in: Lancet. 2009;373(9682):2200. PMID: 19447250.
3. IPPC. Climate change 2014: synthesis report:longer report. © 2025 The Intergovernmental Panel on Climate Change. [Cited:]. Available from: https://www.ipcc.ch/report/ar5/syr/
4. Fanzo JC, Downs SM. Climate change and nutrition-associated diseases. Nat Rev Dis Primers. 2021;7(1):90. PMID: 34887432.
5. Atwoli L, Erhabor GE, Gbakima AA, Haileamlak A, Kayembe Ntumba JM, Kigera J, et al. COP27 Climate Change Conference: urgent action needed for Africa and the world. Ann Oncol. 2023;34(1):7-9. PMID: 36334703.
6. Brenton P, Chemutai V, Pangestu M. Trade and food security in a climate change-impacted world. International Association of Agricultural Economics. 2022;53(4):580-91. doi: 10.1111/agec.12727
7. Deivanayagam TA, English S, Hickel J, Bonifacio J, Guinto RR, Hill KX, et al. Envisioning environmental equity: climate change, health, and racial justice. Lancet. 2023;402(10395):64-78. PMID: 37263280; PMCID: PMC10415673.
8. Di Marco M, Baker ML, Daszak P, De Barro P, Eskew EA, Godde CM, et al. Opinion: Sustainable development must account for pandemic risk. Proc Natl Acad Sci USA. 2020;117(8):3888-92. PMID: 32060123; PMCID: PMC7049118.
9. Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermeulen S, et al. Food in the Anthropocene:the EAT-Lancet Commission on healthy diets from sustainable food systems. Lancet. 2019;393(10170):447-92. Erratum in: Lancet. 2019;393(10171):530. Erratum in: Lancet. 2019;393(10191):2590. Erratum in: Lancet. 2020;395(10221):338. Erratum in: Lancet. 2020;396(10256):e56. PMID: 30660336.
10. Laine JE, Huybrechts I, Gunter MJ, Ferrari P, Weiderpass E, Tsilidis K, et al. Co-benefits from sustainable dietary shifts for population and environmental health: an assessment from a large European cohort study. Lancet Planet Health. 2021;5(11):e786-e796. PMID: 34688354; PMCID: PMC8581185.
11. Hachem F, Vanham D, Moreno LA. Territorial and Sustainable Healthy Diets. Food Nutr Bull. 2020;41(2_suppl):87S-103S. PMID: 33356591.
12. Clayton S. Climate Change and Mental Health. Curr Environ Health Rep. 2021;8(1):1-6. PMID: 33389625.
13. Asgarizadeh Z, Gifford R, Colborne L. Predicting climate change anxiety. J Environ Psychol. 2023;90(1):102087. doi: 10.1016/j.jenvp.2023.102087

14. Gönen Ç, Deveci EÜ, Aydede MN. Development and validation of climate change awareness scale for high school students. Environ Dev Sustain. 2023;25:4525-37. doi: 10.1007/s10668-022-02213-w

15. Köksal E, Bilici S, Çitar Daziroğlu ME, Erdoğan Gövez N. Validity and reliability of the Turkish version of the sustainable and healthy eating behaviors scale. Br J Nutr. 2022:1-20. PMID: 35938236.

16. Żakowska-Biemans S, Pieniak Z, Kostyra E, Gutkowska K. Searching for a measure integrating sustainable and healthy eating behaviors. Nutrients. 2019;11(1):95. PMID: 30621258; PMCID: PMC6357150.

17. Şahin MG, Boztunç Öztürk N. Eğitim alanında ölçek geliştirme süreci: bir içerik analizi çalışması [Scale development process in educational field: a content analysis research]. Kastamonu Üniversitesi Kastamonu Eğitim Dergisi. 2018:191-207. doi:10.24106/kefdergi.375863

18. Henson RK, Roberts JK. Use of exploratory factor analysis in published research: Common errors and some comment on improved practice. Educ Psychol Meas. 2006:393-416. https://doi.org/10.1177/0013164405282485

19. Brown TA, Moore MT. Confirmatory factor analysis. Ed. New York: The Guilford Press; 2012. p. 361-79.

20. Hooper D. Exploratory Factor Analysis. In: Chen H, eds. Approaches to Quantitative Research-Theory and its Practical Application: A Guide to Dissertation Students. Ed. Ireland: Oak Tree Press; 2012.

21. Büyüköztürk Ş. Faktör analizi: temel kavramlar ve ölçek geliştirmede kullanımı [Factor analysis: basic concepts and using to development scale]. Kuram Ve Uygulamada Eğitim Yönetimi. 2002;32:470-83. https://dergipark.org.tr/tr/download/article-file/108451

22. Simon D, Kriston L, Loh A, Spies C, Scheibler F, Wills C, et al. Confirmatory factor analysis and recommendations for improvement of the Autonomy-Preference-Index (API). Health Expect. 2010;13(3):234-43. PMID: 20579122; PMCID: PMC5060541.

23. Tavakol M, Dennick R. Making sense of Cronbach's alpha. Int J Med Educ. 2011;2:53-5. PMID: 28029643; PMCID: PMC4205511.

24. Cronbach L. Coefficient alpha and the internal ture of tests. Psychomerika. 1951;16:297-334. http://cda.psych.uiuc.edu/psychometrika_highly_cited_articles/cronbach_1951.pdf

25. Heale R, Twycross A. Validity and reliability in quantitative studies. Evid Based Nurs. 2015;18(3):66-7. PMID: 25979629.

26. Thompson BL, Green SB, Yang Y. Assessment of the maximal split-half coefficient to estimate reliability. Educ Psychol Meas. 2010;70:232-51. doi: 10.1177/0013164409355688

27. World Health Organization [Internet]. Initiative on Climate Action and Nutrition (I-CAN) 2021. © 2025 WHO [Cited: May 15, 2024]. Available from: https://www.gainhealth.org/resources/reports-and-publications/initiative-climate-action-and-nutrition-i-can

28. Tarım ve Orman Bakanlığı [İnternet]. Sürdürülebilir Gıda Sistemleri Ülke Raporu Türkiye-2021. [Erişim tarihi: 5 Nisan 2024]. Available from: https://www.tarimorman.gov.tr/ABDGM/Belgeler/Uluslararası%20Kuruluşlar/Sürdürülebilir%20Gıda%20Sistemleri%20Ülke%20Raporu%20-%20Türkiye%202021.pdf

29. Özdamar K. Paket Programlarla İstatistiksel Veri Analizi 1. 4. Baskı. Eskişehir: Kaan Kitabevi; 2002.

30. Blackstone NT, El-Abbadi NH, McCabe MS, Griffin TS, Nelson ME. Linking sustainability to the healthy eating patterns of the Dietary Guidelines for Americans: a modelling study. Lancet Planet Health. 2018;2(8):e344-e352. Erratum in: Lancet Planet Health. 2018;2(12):e520. PMID: 30082049.

31. Chevance G, Fresán U, Hekler E, Edmondson D, Lloyd SJ, Ballester J, et al. Thinking health-related behaviors in a climate change context: a narrative review. Ann Behav Med. 2023;57(3):193-204. PMID: 35861123; PMCID: PMC10074036.

32. Metin ZE, Çelik ÖM, Koç N. Relationship between adherence to the Mediterranean diet, sustainable and healthy eating behaviors, and climate change awareness: A cross-sectional study from Turkey. Nutrition. 2024;118:112266. PMID: 37988926.

33. Jürkenbeck K, Spiller A, Schulze M. Climate change awareness of the young generation and its impact on their diet. Cleaner and Responsible Consumption. 2021;3:100041:1-8. doi:10.1016/j.clrc.2021.100041

34. Bose N, Hills T, Sgroi D. Climate change and diet. IZA–Institute of Labor Economics. 2020;13426:1-43. https://docs.iza.org/dp13426.pdf

35. Yardimci H, Demirer B. Is high adaptation to the Mediterranean diet effective in increasing ecological footprint awareness? A cross-sectional study from Turkey. J Sci Food Agric. 2022;102(9):3724-9. PMID: 34907547.