



Effect of a Health Belief Model about Climate Change on Collegians



ARTICLE INFO

Article Type

Original Research

Authors

JumaElywy G.*¹ MSc

Naji A.B.¹ PhD

How to cite this article

JumaElywy G, Naji AB. Effect of a Health Belief Model about Climate Change on Collegians. Health Education and Health Promotion. 2023;11(3):519-524.

ABSTRACT

Aims Climate change is a global challenge that has already had a detrimental impact on the environment and human health, leading to increased magnitude and frequency of extreme weather events such as heat waves, droughts, and flooding. This study aimed to investigate the efficacy of the expanded health belief model related to the perceived benefits of climate change on collegians at the university.

Materials & Methods This experimental randomized controlled trial was conducted at the College of Education for Pure Sciences in AL-Nasiriyah City, Iraq, from October 4th, 2022 to January 3rd, 2023. All 144 students entered the study by census method and were randomly divided into two study and control groups. A questionnaire consisting of two parts; demographic data and health benefits of adopting the anti-climate change behavior scale. Data was analyzed in SPSS 21 software by Chi-square and independent T-tests.

Findings The perceived benefit had no significant difference between the control (29.17 ± 8.82) and the study (29.52 ± 8.05) groups in the pre-test ($p > 0.05$). The study group's perceived benefit in post-test I was increased to 52.31 ± 11.31 , which was significantly ($p < 0.05$) higher than the control group (29.49 ± 8.07). Also, the study group's perceived benefit in post-test II was 51.89 ± 11.60 , which was significantly ($p < 0.05$) higher than the control group (30.14 ± 8.98). There was no statistically significant difference between study groups in the pre-test period ($t = 0.349$; $p = 0.727$). There were statistically significant differences between the study groups at the post-test I ($t = 8.276$; $p = 0.001$) and II periods ($t = 8.895$; $p = 0.001$).

Conclusion The administered expanded health belief model increases the perceived benefits of enhancing the climate change counteraction in collegians.

Keywords Health Belief Model; Climate Change; Perceived Benefits

CITATION LINKS

[1] Changes in climate extremes and their ... [2] Climate change and journalistic norms: A ... [3] Successful adaptation to climate ... [4] A review of the global climate change impacts, adaptation, and ... [5] Prosociality and personality: perceived efficacy of behaviors mediates ... [6] Climate Change 2022: Impacts, Adaptation and ... [7] Research handbook on communicating climate ... [8] Beyond climate change: impacts, adaptation strategies ... [9] Assessment of climate change impact on productivity ... [10] Climate change risk to global port ... [11] A systematic review of dynamics in climate risk and ... [12] Mainstreaming climate change adaptation into development ... [13] The scientific consensus on climate change: How do we know ... [14] Handling climate change education at universities ... [15] Climate change and climate variability: personal motivation ... [16] Injuries from the 2002 North Carolina ice storm, and ... [17] The human health consequences of flooding in ... [18] Climate change and infectious disease in Europe: Impact, projection ... [19] Predictors of public climate change awareness and risk ... [20] Assessment of environmental awareness among students of the ... [21] Community-based adaptation to the health impacts ... [22] Climate change 2001: Impacts, adaptation, and ... [23] Efficacy of the Health Belief Model in enhancing weight loss behaviors to prevent stroke among ... [24] Effectiveness of health education program about health beliefs related to cardiovascular ... [25] Knowledge as a driver of public perceptions about climate ... [26] Burns and Grove's the practice of nursing research: Appraisal, synthesis, and ... [27] Willingness of Iranian young adults to eat organic foods: application of ... [28] Are flood victims more concerned about climate change than other people? the role of ... [29] The association of knowledge with concern about global warming: Trusted information ... [30] Personal efficacy, the information environment, and attitudes toward global ... [31] The power of the Health Belief Model (HBM) to predict water ... [32] Public perceptions of energy consumption and ... [33] Climate change and local public health in the United States: Preparedness ...

¹Department of Community Health Nursing, College of Nursing, University of Baghdad, Baghdad, Iraq

*Correspondence

Address: University of Thi-qar and University of Baghdad. Postal Code: -
Phone: +7726835068
Fax: +96407726835068
ghusson-j@utq.edu.iq

Article History

Received: May 20, 2023

Accepted: June 26, 2023

ePublished: July 2, 2023

Introduction

There is a broad scientific consensus that climate change represents an existential threat to humanity and life on Earth. Climate change is a global challenge that has already had a detrimental impact on the environment and human health, leading to increased magnitude and frequency of extreme weather events such as heat waves, droughts, and flooding [1]. Climate change is the most serious environmental threat of the 21st century [2]. Climate change presents an intricate global challenge spanning multiple aspects of ecology, environment, socio-political dynamics, and socio-economic spheres [3-4]. Failure to reverse the current trends in climate change could lead to profound alterations in life on Earth. This includes the extinction of species, the transformation of arable land, rendering it unsuitable for cultivation, and the warming of seas to a point unsupportive of the current rich diversity of life [5-6].

Human-driven causes of climate change are one of the largest problems faced by the world today. However, the consequences of this change vary substantially in different parts of the world [7]. Human activities have changed the Earth's physical, chemical, and biological circumstances, which has caused unpredictable and complex climate change. This has caused ecological and social disasters, resulting in local and global economic breakdowns [8]. Over the past 65 years, significant global changes, such as observed and anticipated climatic shifts for the twenty-first century, including global warming, have been witnessed worldwide. These changes involve rising temperatures across multiple regions [9, 4]. The industrial revolution notably exacerbated the Earth's climate issues. Addressing this problem promptly and taking necessary actions could potentially enhance the chances of mitigating its detrimental impacts. It's challenging to forecast the exact consequences of climate change precisely for individual sectors [10, 11]. This is demonstrated by the increasing acknowledgment and integration of climatic uncertainties at local and national policymaking levels [12].

Though the global general public seems to be divided in the atmosphere change issues, there is now a growing scientific consensus in the international communities that human-induced climate change is taking place [13]. The human-driven causes of climate change refer to the various activities and practices carried out by humans that significantly contribute to alterations in Earth's climate patterns. Some primary human-driven causes of climate change include burning fossil fuels, deforestation and land use changes, industrial processes, agricultural practices, waste generation, etc.

The complex global climate system, encompassing the Earth and socio-ecological systems, demands in-depth investigation and reflective and transformative educational approaches [14]. Proactive measures are

essential to avert detrimental impacts from climate change on individuals and society, necessitating strategic actions from both individuals and the private/public sectors. Climate change is expected to alter the likelihood of extreme weather events, associated with various adverse health outcomes such as heat-related fatalities and illnesses during heatwaves [15]; injuries from severe weather occurrences [16]; injuries and fatalities from flooding incidents [17]; as well as the emergence or resurgence of infectious diseases like hantavirus-linked hemorrhagic fever, West Nile fever, or Lyme disease [18]. Remarkable occurrences such as the 2003 European heatwave or Hurricane Katrina in 2005 can be viewed in isolation or as part of a pattern of events with heightened frequency, duration, and intensity. Consequently, comprehending climate change proves challenging as many climate-related events like natural disasters or disease outbreaks cannot be directly attributed to climate change, making it less intuitive and difficult to communicate.

Awareness, knowledge, and understanding of climate change are generally low in the wider public and vary within and between countries [19]. The issue of achieving environmental awareness is represented by its three sides the state and its organs, the society with all its institutions, and the individuals who constitute the protectors of the environment in the event the availability of knowledge, awareness, and correct understanding of their role towards the environment, or those who work to pollute it in the absence of awareness, misunderstanding and loss of a sense of responsibility towards the environment [20].

We investigated mitigation and adaptation options to evaluate individuals' motivation in taking precautionary measures to mitigate climate risks. Mitigation involves reducing greenhouse gas emissions and enhancing greenhouse gas sinks to curtail the scope of global warming [18]. These measures encompass conserving energy through increased vehicle fuel efficiency, transitioning to cleaner energy sources by altering business practices, or carbon sequestration through reforestation. However, these practices have proven notably sluggish and challenging to implement effectively. Moreover, even if successfully enacted, their impact on global climate change may not manifest for decades due to the enduring nature of greenhouse gases in the atmosphere [21].

Consequently, adaptation to climate change impacts becomes crucial on an individual and communal level [21]. Adaptation involves adjusting environmental or social settings in response to past, present, or anticipated climate-related events to mitigate their consequences [18]. Autonomous adaptation occurs naturally without public intervention and is reactive, responding to current climate impacts. On the other hand, anticipatory adaptation is proactive and

planned, initiated before the observable impacts of climate change. It relies on scientific projections and is typically executed by governmental bodies [18].

The Health Belief Model (HBM) is a psychological health behavior change model developed in 1950 by some United States (US) public health researchers to improve human lifestyle toward healthy behaviors. This applies to enhancing the perceived climatic changes. For more information about using HBM, see systematic review by [23]. Of course, we can't live forever, but we can extend our lives and be healthier in old age by making several lifestyle changes [24]. The literature on climate change has identified many barriers that prevent climate change action from being undertaken at individual and higher levels. Several studies highlight a lack of knowledge and awareness among the public as a main challenge [25]. So, providing the public with enhanced people's awareness about climatic changes is essential.

This study aimed to investigate the efficacy of the expanded health belief model related to the perceived benefits of climate change on collegians at the university.

Materials and Methods

This experimental randomized controlled trial was conducted at the College of Education for Pure Sciences in AL-Nasiriyah City, Iraq, from October 4th, 2022, to January 3rd, 2023. All the students (n=144) entered the study by census method and were randomly divided into two study and control groups (each 72).

A questionnaire consisting of two parts was used for data gathering. Part I was a self-administered questionnaire relevant to the student's demographic data, and Part II was a self-administered sheet about the health benefits of adopting the anti-climate change behavior scale [26] with 14 items measured on a 5-point Likert scale and rated as 1 (strongly disagree) to 5 (strongly agree). The study protocol and instrument underwent a series of revisions and modifications and were achieved by 10 experts from different scientific branches; each of those experts had more than ten years of experience in their field of specialty. The researcher proposed that each expert member review the study instrument for content, simplicity, relevance, style, and suitability. Each expert revised the instrument regarding the scientific content, sequence of information, and competence to collect the sample. The researcher stays with the participants until they have finished the self-report. The estimated time to fill out each form was approximately 20-25 minutes. The Cronbach α value ranged from 0.7 to higher, indicating a high degree of reliability.

After obtaining the legal permissions, the researchers started the sampling, and both groups filled the questionnaire as the pre-test. Then the study group went under the instructional program that included

six 90-minute sessions (introduction to climate change; global warming phenomena; sources of greenhouse gases; harmful effects of climate change; impacts of climate change in the short-medium-long term; and the dangers of global warming in Iraq). The questionnaire was filled 25 days after the interventional program (as post-test I) and 75 days after the interventional program (as post-test II). The control group didn't go under any program.

Data was analyzed in SPSS 21 software by Chi-square and independent T-tests.

Findings

The mean age of the study group was 20.51 \pm 1.21 years, and the control group was 20.44 \pm 1.31 years ($p>0.05$; Table 1).

Table 1. Comparing the distribution of groups' samples according to demographic parameters

Parameter	Study group		Control group		p-Value
	No.	%	No.	%	
Age (year)					
19	6	8.3	11	15.3	0.45
20	46	63.9	43	59.7	
21	8	11.1	6	8.3	
22	4	5.6	2	2.8	
23	5	6.9	7	9.7	
24	3	4.2	3	4.2	
Gender					
Male	48	66.7	43	59.7	0.079
Female	24	33.3	29	40.3	
Residents					
Urban	57	79.2	61	84.7	0.125
Rural	15	20.8	11	15.3	
Living Arrangements					
With parents	62	86.1	57	79.2	0.089
With mother	4	5.6	9	12.5	
With father	3	4.2	1	1.4	
With relatives	3	4.2	5	6.9	
Socioeconomic class					
Upper lower	14	19.4	22	30.6	0.097
Lower middle	54	75.0	47	65.3	
Upper middle	4	5.6	3	4.2	

The perceived benefit had no significant difference between the control (29.17 \pm 8.82) and the study (29.52 \pm 8.05) groups in the pre-test ($p>0.05$). The study group's perceived benefit in post-test I was increased to 52.31 \pm 11.31, which was significantly ($p<0.05$) higher than the control group (29.49 \pm 8.07). Also, the study group's perceived benefit in post-test II was 51.89 \pm 11.60, which was significantly ($p<0.05$) higher than the control group (30.14 \pm 8.98; Table 2).

Table 2. Frequency (the numbers in parentheses are percentages) of the responses regarding perceived benefits (Low=14-32.66; Fair=32.67-51.33; High=51.34-70) in study groups

Group/Period	Low	Fair	High
Study Group			
Pre-test	52 (72.2)	18 (25.0)	2 (2.8)
Post-test I	0 (0.0)	34 (47.2)	38 (52.8)
Post-test II	1 (1.4)	34 (47.2)	37 (51.4)
Control Group			
Pre-test	53 (73.6)	17 (23.6)	2 (2.8)
Post-test I	52 (72.2)	18 (25.0)	2 (2.8)
Post-test II	51 (70.8)	18 (25.0)	18 (25)

There was no statistically significant difference between study groups in the pre-test period ($t=0.349$; $p=0.727$). There were statistically significant differences between the study groups at the post-test I ($t=8.276$; $p=0.001$) and II periods ($t=8.895$; $p=0.001$; Table 3).

Table 3. Pairwise comparison of the perceived benefits enhancing climate change counteraction behaviors in the study (standard error=0.1244) and control (standard error=0.10066) groups

Groups	(I)	(J)	(I-J)	Sig.	95% Confidence	
					Lower	Upper
Study	Pre-test	Post-test I	-1.62698	0.001	-1.8722	-1.3818
		Post-test II	-1.59722	0.001	-1.8424	-1.3520
	Post-test I	Pre-test	1.62698	0.001	1.3818	1.8722
		Post-test II	.02976	0.811	-0.2155	0.2750
	Post-test II	Pre-test	1.59722	0.001	1.3520	1.8424
		Post-test I	-.02976	0.811	-0.2750	0.2155
Control	Pre-test	Post-test I	-.02282	0.821	-0.2212	0.1756
		Post-test II	-.06944	0.491	-0.2679	0.1290
	Post-test I	Pre-test	.02282	0.821	-0.1756	0.2212
		Post-test II	-.04663	0.644	-0.2450	0.1518
	Post-test II	Pre-test	.06944	0.491	-0.1290	0.2679
		Post-test I	.04663	0.644	-0.1518	0.2450

Discussion

Human involvement in triggering global climate change is now unquestionable, and the resulting effects on both human and natural systems will be extensive and severe, and particularly affect the most vulnerable populations, both in terms of physical well-being and economic stability, across the globe. [23].

Given these significant changes and the crucial need to comprehend them for the purpose of adaptation and suitable responses, the development of educational programs to enlighten the general public is of paramount importance. Various models derived from social psychology have been employed to grasp behaviors related to water conservation. These models include the Theory of Planned Behavior (TPB), the Social Cognitive Theory, the Theory of Reasoned Action, and the Value-Belief-Norm (VBN) Theory [26]. In this study, we utilized the Health Belief Model (HBM) theory to address the challenges linked to climate change. We selected HBM due to its effectiveness in examining preventive actions, offering distinct advantages in understanding preventive behavior. HBM is a well-known and effective theory regarding behavior alteration and preventive measures designed around fear and risk perception. Unlike numerous other theories, HBM comprehensively elucidates individual behavior's intricate and multifaceted nature [26]. This study aimed to assess the effectiveness of an extended Health Belief Model, specifically regarding the perceived benefits related to climate change, in encouraging proactive responses among university students. The results indicated a noteworthy impact of employing the Health Belief Model in training sessions, enhancing the students' perception of climate change. Although the Health Belief Model, using psychological concepts, proves effective in augmenting individuals' comprehension, this study

utilized the model to explore how perceptions of climate change might enhance proactive engagement among college students. Similarly, other research studies, akin to ours demonstrated that while not explicitly examining the psychological elements of the Health Belief Model, adaptive responses to climate change are more closely associated with variables such as environmental attitudes, political inclinations, and attitudes toward scientists [27-29].

in accordance with the findings of this study, Tajeri Moghadam *et al.* [30] demonstrated that the Health Belief Model (HBM) is a suitable framework for examining the water conservation practices of farmers. When individuals perceive and acknowledge a risk (such as water scarcity), they are more inclined to engage in actions to avert that risk (in this case, water conservation behavior), and conversely. Additionally, the HBM elucidates why certain individuals opt not to partake in preventive actions (in this context, water conservation behavior) [30].

Research on attitudes and public perceptions of global climate change has been explored in various surveys [18, 31]. A recent study focusing on U.S. local public health department directors revealed their limited proactive response to climate change, partly attributed to their belief that the general public lacks awareness of climate change impacts and, therefore, would be disinclined to support efforts for mitigation and adaptation [32]. According to Semenza *et al.* [18], most individuals claim awareness of environmental and health risks linked to climate change and acknowledge their vulnerability to its effects. Those concerned about climate change hazards are more actively involved in individual actions [18]. Their survey delved specifically into vulnerability and risk perception concerning climate change, indicating that most respondents wanted to contribute to climate solutions, aligning with similar findings from other studies [18].

In summary, the studies in accordance with this study suggest that perceived benefits are essential in promoting response actions toward climate change. The HBM can be used to understand and predict climate change-related behaviors, such as energy conservation and mitigation. The perceived benefits of climate change counteraction behaviors can be improved through interventions based on the HBM. The relationship between media and smog-related health behavior is interceded by perceived benefits and threats. Perceived benefit can be the strongest predictor of practices concerning climate change, while perceived severity, perceived barriers, self-efficacy, and cues to action are also significant predictors.

There is a need to develop and establish environmental protection education programs to enhance the environmental awareness of all students and encourage them to adopt environmentally friendly behaviors to minimize the dangers of global warming.

Conclusion

The administered expanded health belief model increases the perceived benefits of enhancing the climate change counteraction in collegians.

Acknowledgements: We would like to thank all students who cooperated with us through their answers to our questions and education institution.

Ethical Issues: This study received ethical approval from College of Nursing/University of Baghdad Ethics Committee.

Conflicts of Interests: This article is a doctoral dissertation done by doctoral student Ghosoun Jumaa in cooperation with research supervisor Arkan Naji.

Authors' Contribution: JumaElywy G (First Author), Introduction Writer/Main Researcher/Statistical Analyst/Discussion Writer (50%); Naji AB (Second Author), Methodologist/Assistant Researcher/Discussion Writer (50%)

Funding/Support: Nothing was reported by the authors.

References

- 1- Seneviratne S, Nicholls N, Easterling D, Goodess C, Kanae S, Kossin J, et al. Changes in climate extremes and their impacts on the natural physical environment. Cambridge: Cambridge University Press; 2012.
- 2- Boykoff MT, Boykoff JM. Climate change and journalistic norms: A case-study of US mass-media coverage. *Geoforum*. 2007;38(6):1190-204.
- 3- Adger WN, Arnell NW, Tompkins EL. Successful adaptation to climate change across scales. *Glob Environ Chang*. 2005;15(2):77-86.
- 4- Abbass K, Zeeshan Qasim M, Son H, Murshed M, Mahmood H, Younis J. A review of the global climate change impacts, adaptation, and sustainable mitigation measures. *Environ Sci Pollut Res*. 2022;29:42539-59
- 5- Nezlek JB, Cyprianska M. Prosociality and personality: perceived efficacy of behaviors mediates relationships between personality and self-reported climate change mitigation behavior. *Int J Environ Res Public Health*. 2023;20(4):3637.
- 6- Pörtner HO, Roberts DC, Tignor M, Poloczanska ES, Mintenbeck K, Alegría A, et al. Climate Change 2022: Impacts, Adaptation and Vulnerability Working Group II Contribution to the IPCC Sixth Assessment Report. Cambridge: Cambridge University Press; 2022.
- 7- Holmes DC, Richardson LM. Research handbook on communicating climate change. Cheltenham: Edward Elgar Publishing; 2020.
- 8- Karimi V, Valizadeh N, Rahmani S, Bijani M, Karimi M. Beyond climate change: impacts, adaptation strategies, and influencing factors. New York: Springer; 2022.
- 9- Yadav MK, Singh R, Singh K, Mall R, Patel C, Yadav S, Singh M. Assessment of climate change impact on productivity of different cereal crops in Varanasi. *India J Agrometeorol*. 2015;17(2):179-84
- 10- Izaguirre C, Losada I, Camus P, Vigh J, Stenek V. Climate change risk to global port operations. *Nat Clim Chang*. 2021;11(1):14-20
- 11- Jurgilevich A, Räsänen A, Groundstroem F, Juhola S. A systematic review of dynamics in climate risk and vulnerability assessments. *Environ Res Lett*. 2017;12(1):013002.

- 12- Ayers J, Huq S, Wright H, Faisal A, Hussain S. Mainstreaming climate change adaptation into development in Bangladesh. *Clim Dev*. 2014;6:293-305
- 13- Oreskes N. The scientific consensus on climate change: How do we know we're not wrong?. *Clim modeling*; 2018:31-46.
- 14- Filho WL, Sima M, Sharifi A, Lutez JM, Salvia AL, Mifsud M, et al. Handling climate change education at universities: an overview. *Environ Sci Eur*. 2021;33(109).
- 15- Semenza JC, Ploubidis GB, George LA. Climate change and climate variability: personal motivation for adaptation and mitigation. *Environ Health*. 2011;10(46).
- 16- Broder JMA, Tintinalli J. Injuries from the 2002 North Carolina ice storm, and strategies for prevention. *Injury*. 2005;36: 21-26.
- 17- Hajat S, Ebi KL, Kovats RS, Menne B, Edwards S, Haines A. The human health consequences of flooding in Europe: a Review. In: Kirch W, Bertollini, R, Menne B. (eds) Extreme weather events and public health responses. Berlin: Springer; 2003.
- 18- Semenza JC, Sholmit P. Climate change and infectious disease in Europe: Impact, projection and adaptation. *Lancet Reg Health*. 2021;9:100230.
- 19- Lee TM, Markowitz EM, Howe PD, Ko CY, Leiserowitz AA. Predictors of public climate change awareness and risk perception around the world. *Nat Clim Change*. 2015;5:1014-20.
- 20- Yahya BA, Ali HS, Saad DN. Assessment of environmental awareness among students of the University Mosul. *Mosul J of Nurs*. 2022;21;10(3):140-6
- 21- Ebi KL, Semenza JC. Community-based adaptation to the health impacts of climate change. *Am J Prev Med*. 2008;35(5): 501-7.
- 22- McCarthy JJ, Canziani OF, Leary NA, Dokken DJ, White KS. Climate change 2001: Impacts, adaptation, and vulnerability. Cambridge: Cambridge University Press; 2001.
- 23- Naji AB, Baktash MQ. Efficacy of the Health Belief Model in enhancing weight loss behaviors to prevent stroke among overweight and obese geriatrics homes residents in Baghdad City. *Kufa J Nurs Sci*. 2019;9(2):51-8.
- 24- Resham AK, Naji AB. Effectiveness of health education program about health beliefs related to cardiovascular disease on readiness of engagement in healthy behaviors of older adults at geriatric home in Baghdad City. *Int J Sci Res PuB*. 2016;6(11):2250-3153.
- 25- Shi J, Visschers VHM, Siegrist M, Arvai J. Knowledge as a driver of public perceptions about climate change reassessed. *Nat Clim Change*. 2016;6(8):759-62.
- 26- Yazdanpanah M, Forouzani M, Hajjati M. Willingness of Iranian young adults to eat organic foods: application of the Health Belief Model. *Food Qual Prefer*. 2015;41:75-83.
- 27- Whitmarsh L. Are flood victims more concerned about climate change than other people? the role of direct experience in risk perception and behavioral response. *J Risk Res*. 2008;11(3):351-74.
- 28- Malka A, Krosnick J, Langer G. The association of knowledge with concern about global warming: Trusted information sources shape public thinking. *Risk Anal*. 2009;29:633-647.
- 29- Kellstedt PM, Zahran S, Vedlitz A. Personal efficacy, the information environment, and attitudes toward global warming and climate change in the United States. *Risk Anal*. 2008;28(1):113-126.

- 30- Tajeri Moghadam M, Roheli H, Zarifian S, Yazdanpanah M. The power of the Health Belief Model (HBM) to predict water demand management: A case study of farmers' water conservation in Iran. *J Environ Manag.* 2020;236:110388.
- 31- Attari SZ, Dekay ML, Davidson CI, Bruine de Bruin W. Public perceptions of energy consumption and savings. *Proc Natl Acad Sci USA.* 2010;107(37):16054-59.
- 32- Maibach EW, Chadwick A, McBride D, Chuk M, Ebi KL, Balbus J. Climate change and local public health in the United States: Preparedness, programs and perceptions of local public health department directors. *PLoS ONE.* 2008;3(7):e2838.