



< Back to results | 1 of 5 Next >

Download Print Save to PDF Save to list Create bibliography

*Malaysian Journal of Medicine and Health Sciences* • Open Access • Volume 19, Issue 3, Pages 82 - 90 • 2023

#### Document type

Article • Bronze Open Access

#### Source type

Journal

#### ISSN

16758544

#### DOI

10.47836/MJMHS.19.3.11

View more

# Prevalence of Mental Health Problems Among University Students and Association With Body Mass Index (BMI) and Diet Quality

Azhar, Nur Nadhira Khairul<sup>a</sup>; Ibrahim, Muhamad Ariff<sup>a</sup> ; Halim, Mohd Radzi Tarmizi A.<sup>b</sup>; Shamsuddin, Aida Soraya<sup>c</sup>; Azahari, Nuraniza<sup>a</sup>; Malek, Mohd Ahsani A.<sup>d</sup>

Save all to author list

<sup>a</sup> Department of Nutrition Sciences, Kulliyah of Allied Health Sciences, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, Pahang, Kuantan, 25200, Malaysia

<sup>b</sup> Faculty of Business, Economic and Social Development, University Malaysia Terengganu, Terengganu, Kuala Terengganu, 21300, Malaysia

<sup>c</sup> Southeast Asia Disaster Prevention Research Initiative (SEADPRI), Institute for Environment and Development (LESTARI), University Kebangsaan Malaysia, Selangor, Bangi, 43600, Malaysia

<sup>d</sup> Department of Human Sciences, Faculty of Islamic Studies, Universiti Sultan Azlan Shah, Perak, Kuala Kangsar, 33000, Malaysia

View PDF Full text options Export

## Abstract

Author keywords

SciVal Topics

Metrics

Funding details

## Abstract

**Introduction:** Numerous factors contributed to the susceptibility of university students to develop mental health issues. **Objective:** This study aimed to assess the prevalence of mental health problems among International Islamic University Malaysia (IIUM) students and their relationships with diet quality and body mass index (BMI). **Methods:** A cross-sectional study was conducted among 104 students. The Depression, Anxiety, and Stress Scale (DASS-21) was used to assess students' depression, anxiety, and stress levels. The Malaysian Healthy Eating Index (M-HEI) was used to assess diet quality. Spearman Rho was used to determine the relationships between variables. **Results:** Approximately 69.4% (n = 34), 71.4% (n = 35), and 48.9% (n = 34) of male students experienced moderate to extremely

## Cited by 0 documents

Inform me when this document is cited in Scopus:

[Set citation alert >](#)

## Related documents

Higher dietary fat quality is associated with lower anxiety score in women: A cross-sectional study

Fatemi, F. , Siassi, F. , Qorbani, M. (2020) *Annals of General Psychiatry*

Targeted Primary and Secondary Preventive Strategies for Depression among Malaysian Pharmacy Students

Wahab, I.A. , Goh, K.W. , Zainal, Z.A.

(2022) *International Journal of Environmental Research and Public Health*

Body dysmorphic disorder and depression among male undergraduate students in a Malaysian University

Kang, W.H. , Loo, M.Y. , Leong, X.M. (2022) *Frontiers in Psychiatry*

View all related documents based on references

Find more related documents in Scopus based on:

Authors > Keywords >

severe symptoms of depression, anxiety, and stress, respectively. In contrast, 85.4% (n = 47), 89.1% (n = 49), and 54.6% (n = 30) of female students had moderate to extremely severe symptoms of depression, anxiety, and stress, respectively. No correlations were found between diet quality and BMI with students' mental health problems. For male students, there were negative significant associations reported between fat-rich foods (r = -0.447, p-value = 0.001) and sugar-rich foods (r = -0.332, p-value = 0.020) intake with depression; a positive significant relationship between fruit intake and anxiety (r = 0.284, p-value = 0.048); a positive relationship between fruit intake and stress (r = 0.300, p-value = 0.036); and a negative relationship between fat-rich foods and stress (r = -0.293, p-value = 0.041). Female students only had a significant negative correlation between fish intake and anxiety (r = -0.376, p-value = 0.005). Conclusion: No associations were found between diet quality, BMI, and mental health problems. A more profound comprehension of the connections between risk factors and mental health could lead to new intervention strategies. © 2023 UPM Press. All rights reserved.

## Author keywords

Anxiety; BMI; Depression; Diet Quality; Mental Health; Stress; Student

---

SciVal Topics 



---

Metrics



---

Funding details




---

## References (40)

[View in search results format >](#)

All

[CSV export](#)  [Print](#) [E-mail](#) [Save to PDF](#)

[Create bibliography](#)

- 
- 1 Amir Hamzah, N.S., Nik Farid, N.D., Yahya, A., Chin, C., Su, T.T., Rampal, S.R.L., Dahlui, M.  
**The Prevalence and Associated Factors of Depression, Anxiety and Stress of First Year Undergraduate Students in a Public Higher Learning Institution in Malaysia**  
*(2019) Journal of Child and Family Studies, 28 (12), pp. 3545-3557. Cited 16 times.*  
<https://link.springer.com/journal/10826>  
doi: 10.1007/s10826-019-01537-y  
[View at Publisher](#)
- 
- 2 Sheldon, E., Simmonds-Buckley, M., Bone, C., Mascarenhas, T., Chan, N., Wincott, M., Gleeson, H., (...), Barkham, M.  
**Prevalence and risk factors for mental health problems in university undergraduate students: A systematic review with meta-analysis**  
*(2021) Journal of Affective Disorders, 287, pp. 282-292. Cited 122 times.*  
[www.elsevier.com/locate/jad](http://www.elsevier.com/locate/jad)  
doi: 10.1016/j.jad.2021.03.054  
[View at Publisher](#)
- 
- 3 Fauzi, M.F., Anuar, T.S., Teh, L.K., Lim, W.F., James, R.J., Ahmad, R., Mohamed, M., (...), Salleh, M.Z.  
**Stress, anxiety and depression among a cohort of health sciences undergraduate students: The prevalence and risk factors**  
*(2021) International Journal of Environmental Research and Public Health, 18 (6), art. no. 3269, pp. 1-14. Cited 24 times.*  
<https://www.mdpi.com/1660-4601/18/6/3269/pdf>  
doi: 10.3390/ijerph18063269  
[View at Publisher](#)
-

- 
- 4 Hersi, L., Tesfay, K., Gesesew, H., Krahl, W., Ereg, D., Tesfaye, M.  
Mental distress and associated factors among undergraduate students at the University of Hargeisa, Somaliland: A cross-sectional study ([Open Access](#))
- (2017) *International Journal of Mental Health Systems*, 11 (1), art. no. 39. Cited 28 times.  
<http://www.ijmhs.com/>  
doi: 10.1186/s13033-017-0146-2
- [View at Publisher](#)
- 
- 5 Ahmed, G., Negash, A., Kerebih, H., Alemu, D., Tesfaye, Y.  
Prevalence and associated factors of depression among Jimma University students. A cross-sectional study
- (2020) *International Journal of Mental Health Systems*, 14 (1), art. no. 52. Cited 19 times.  
<http://www.ijmhs.com/>  
doi: 10.1186/s13033-020-00384-5
- [View at Publisher](#)
- 
- 6 Sarokhani, D., Delpisheh, A., Veisani, Y., Sarokhani, M.T., Manesh, R.E., Sayehmiri, K.  
Prevalence of depression among university students: A systematic review and meta-analysis study ([Open Access](#))
- (2013) *Depression Research and Treatment*, 2013, art. no. 373857. Cited 127 times.  
doi: 10.1155/2013/373857
- [View at Publisher](#)
- 
- 7 Zapata-Ospina, J.P., Patiño-Lugo, D.F., Vélez, C.M., Campos-Ortiz, S., Madrid-Martínez, P., Pemberthy-Quintero, S., Pérez-Gutiérrez, A.M., (...), Vélez-Marín, V.M.  
Mental health interventions for college and university students during the COVID-19 pandemic: a critical synthesis of the literature ([Open Access](#))
- (2021) *Revista Colombiana de Psiquiatria*, 50 (3), pp. 199-213. Cited 20 times.  
<http://www.elsevier.com/journals/revista-colombiana-de-psiquiatria/0034-7450>  
doi: 10.1016/j.rcp.2021.04.007
- [View at Publisher](#)
- 
- 8 Shamsuddin, K., Fadzil, F., Ismail, W.S.W., Shah, S.A., Omar, K., Muhammad, N.A., Jaffar, A., (...), Mahadevan, R.  
Correlates of depression, anxiety and stress among Malaysian university students
- (2013) *Asian Journal of Psychiatry*, 6 (4), pp. 318-323. Cited 271 times.  
doi: 10.1016/j.ajp.2013.01.014
- [View at Publisher](#)
- 
- 9 Açık, M., Altan, M., Çakiroğlu, F.P.  
A cross-sectionally analysis of two dietary quality indices and the mental health profile in female adults ([Open Access](#))
- (2022) *Current Psychology*, 41 (8), pp. 5514-5523. Cited 3 times.  
<https://link.springer.com/journal/12144>  
doi: 10.1007/s12144-020-01065-9
- [View at Publisher](#)
-

- 
- 10 Davison, J., Stewart-Knox, B., Connolly, P., Lloyd, K., Dunne, L., Bunting, B.  
Exploring the association between mental wellbeing, health-related quality of life, family affluence and food choice in adolescents ([Open Access](#))
- (2021) *Appetite*, 158, art. no. 105020. Cited 23 times.  
<http://www.elsevier.com/inca/publications/store/6/2/2/7/8/5/index.htm>  
doi: 10.1016/j.appet.2020.105020
- [View at Publisher](#)
- 
- 11 Schweren, L.J.S., Larsson, H., Vinke, P.C., Li, L., Kvalvik, L.G., Arias-Vasquez, A., Haavik, J., (...), Hartman, C.A.  
Diet quality, stress and common mental health problems: A cohort study of 121,008 adults ([Open Access](#))
- (2021) *Clinical Nutrition*, 40 (3), pp. 901-906. Cited 23 times.  
<http://www.elsevier-international.com/journals/clnu/>  
doi: 10.1016/j.clnu.2020.06.016
- [View at Publisher](#)
- 
- 12 Vermeulen, E., Stronks, K., Snijder, M.B., Schene, A.H., Lok, A., De Vries, J.H., Visser, M., (...), Nicolaou, M.  
A combined high-sugar and high-saturated-fat dietary pattern is associated with more depressive symptoms in a multi-ethnic population: The HELIUS (Healthy Life in an Urban Setting) study
- (2017) *Public Health Nutrition*, 20 (13), pp. 2374-2382. Cited 25 times.  
<http://journals.cambridge.org/PHN>  
doi: 10.1017/S1368980017001550
- [View at Publisher](#)
- 
- 13 Jacka, F.N., Pasco, J.A., Williams, L.J., Meyer, B.J., Digger, R., Berk, M.  
Dietary intake of fish and PUFA, and clinical depressive and anxiety disorders in women
- (2013) *British Journal of Nutrition*, 109 (11), pp. 2059-2066. Cited 75 times.  
doi: 10.1017/S0007114512004102
- [View at Publisher](#)
- 
- 14 Richard, A., Rohrmann, S., Pestoni, G., Strippoli, M.-P.F., Lasserre, A., Marques-Vidal, P., Preisig, M., (...), Vandeleur, C.L.  
Associations between anxiety disorders and diet quality in a Swiss cohort study ([Open Access](#))
- (2022) *Comprehensive Psychiatry*, 118, art. no. 152344. Cited 7 times.  
<http://www.journals.elsevier.com/comprehensive-psychiatry/>  
doi: 10.1016/j.comppsy.2022.152344
- [View at Publisher](#)
- 
- 15 Liu, X., Yan, Y., Li, F., Zhang, D.  
Fruit and vegetable consumption and the risk of depression: A meta-analysis ([Open Access](#))
- (2016) *Nutrition*, 32 (3), pp. 296-302. Cited 199 times.  
[www.elsevier.com/locate/nut](http://www.elsevier.com/locate/nut)  
doi: 10.1016/j.nut.2015.09.009
- [View at Publisher](#)
-

- 
- 16 Sadeghi, O, Keshteli, AH, Afshar, H, Esmailzadeh, A, Adibi, P.  
Adherence to Mediterranean dietary pattern is inversely associated with depression, anxiety and psychological distress  
(2019) *Nutritional Neuroscience*, pp. 1-12. Cited 13 times.
- 
- 17 Meegan, A.P., Perry, I.J., Phillips, C.M.  
The association between dietary quality and dietary guideline adherence with mental health outcomes in adults: A cross-sectional analysis ([Open Access](#))  
  
(2017) *Nutrients*, 9 (3), art. no. 238. Cited 36 times.  
<http://www.mdpi.com/2072-6643/9/3/238/pdf>  
doi: 10.3390/nu9030238  
  
View at Publisher
- 
- 18 Noruzi, Z., Shiraseb, F., Mirzababaei, A., Mirzaei, K.  
Association of the dietary phytochemical index with circadian rhythm and mental health in overweight and obese women: A cross-sectional study ([Open Access](#))  
  
(2022) *Clinical Nutrition ESPEN*, 48, pp. 393-400. Cited 2 times.  
<http://www.journals.elsevier.com/clinical-nutrition-espen>  
doi: 10.1016/j.clnesp.2022.01.012  
  
View at Publisher
- 
- 19 Amin, V., Flores, C.A., Flores-Lagunes, A.  
The impact of BMI on mental health: Further evidence from genetic markers ([Open Access](#))  
  
(2020) *Economics and Human Biology*, 38, art. no. 100895. Cited 5 times.  
[http://www.elsevier.com/wps/find/journaldescription.cws\\_home/622964/description#description](http://www.elsevier.com/wps/find/journaldescription.cws_home/622964/description#description)  
doi: 10.1016/j.ehb.2020.100895  
  
View at Publisher
- 
- 20 Gomes, A.P., Gonçalves, H., dos Santos Vaz, J., Kieling, C., Rohde, L.A., Oliveira, I.O., Gonçalves Soares, A.  
Do inflammation and adiposity mediate the association of diet quality with depression and anxiety in young adults? ([Open Access](#))  
  
(2021) *Clinical Nutrition*, 40 (5), pp. 2800-2808. Cited 10 times.  
<http://www.elsevier-international.com/journals/clnu/>  
doi: 10.1016/j.clnu.2021.03.028  
  
View at Publisher
- 
- 21 Lovibond, P.F., Lovibond, S.H.  
The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories ([Open Access](#))  
  
(1995) *Behaviour Research and Therapy*, 33 (3), pp. 335-343. Cited 8080 times.  
doi: 10.1016/0005-7967(94)00075-U  
  
View at Publisher
-

- 22 Rezali, F.W., Chin, Y.S., Shariff, Z.M., Mohd Yusof, B.N., Sanker, K., Woon, F.C.  
Evaluation of diet quality and its associated factors among adolescents in Kuala Lumpur, Malaysia ([Open Access](#))  
  
(2015) *Nutrition Research and Practice*, 9 (5), pp. 511-516. Cited 28 times.  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4575964/pdf/nrp-9-511.pdf>  
doi: 10.4162/nrp.2015.9.5.511  
  
View at Publisher
- 
- 23 Pei, C.S., Appannah, G., Sulaiman, N.  
Household food insecurity, diet quality, and weight status among indigenous women (Mah meri) in peninsular Malaysia  
  
(2018) *Nutrition Research and Practice*, 12 (2), pp. 135-142. Cited 35 times.  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5886965/pdf/nrp-12-135.pdf>  
doi: 10.4162/nrp.2018.12.2.135  
  
View at Publisher
- 
- 24 Appannah, G., Emi, N.A., Yusin, N.A.A., Gan, W.Y., Shariff, Z.M., Shamsuddin, N.H., Zaini, A.A., (...), Appukutty, M.  
Evaluation of dietary quality using Malaysian healthy eating index and its relationships with cardiometabolic risk factors in Malaysian adolescents  
  
(2020) *Malaysian Journal of Medicine and Health Sciences*, 16 (6), pp. 46-55. Cited 5 times.  
[https://medic.upm.edu.my/upload/dokumen/2020081013490906\\_MJMHS\\_0075.pdf](https://medic.upm.edu.my/upload/dokumen/2020081013490906_MJMHS_0075.pdf)
- 
- 25 Mohammed, H, Hayati, KS, Salmiah, MS.  
Coping with depression, anxiety, and stress: A cross-sectional study among Malaysian students in a public university  
(2016) *Journal of Dental and Medical Sciences*, 15 (11), pp. 83-95. Cited 8 times.
- 
- 26 Facundes, V.L.D., Ludermir, A.B.  
Common mental disorders among health care students ([Open Access](#))  
  
(2005) *Revista Brasileira de Psiquiatria*, 27 (3), pp. 194-200. Cited 58 times.  
[http://www.scielo.br/scielo.php?script=sci\\_serial&pid=1516-4446&lng=en&rm=iso](http://www.scielo.br/scielo.php?script=sci_serial&pid=1516-4446&lng=en&rm=iso)  
doi: 10.1590/S1516-44462005000300007  
  
View at Publisher
- 
- 27 Nahas, A.R.M.F., Elkalmi, R.M., Al-Shami, A.M., Elsayed, T.M.  
Prevalence of depression among health sciences students: Findings from a public university in Malaysia ([Open Access](#))  
  
(2019) *Journal of Pharmacy and Bioallied Sciences*, 11 (2), pp. 170-175. Cited 24 times.  
<http://www.jpbonline.org>  
doi: 10.4103/JPBS.JPBS\_263\_18  
  
View at Publisher
-

- 28 Bahrami, F., Yousefi, N.  
Females are more anxious than males: A metacognitive perspective ([Open Access](#))  
  
(2011) *Iranian Journal of Psychiatry and Behavioral Sciences*, 5 (2), pp. 83-90. Cited 86 times.  
[http://206.223.176.35/files/onlinejournals\\_889015=%20bahrami-yusefi-99.pdf](http://206.223.176.35/files/onlinejournals_889015=%20bahrami-yusefi-99.pdf)
- 
- 29 Ghaedi, L., Kosnin, A.B.M.  
Prevalence of depression among undergraduate students: Gender and age differences ([Open Access](#))  
  
(2014) *International Journal of Psychological Research*, 7 (2), pp. 38-50. Cited 12 times.  
<http://www.redalyc.org/articulo.oa?id=299032684005#>  
doi: 10.21500/20112084.657  
  
[View at Publisher](#)
- 
- 30 Oftedal, S., Glozier, N., Holliday, E.G., Duncan, M.J.  
Diet quality and depressive symptoms. Assessing the direction of the association in a population-based cohort study ([Open Access](#))  
  
(2020) *Journal of Affective Disorders*, 274, pp. 347-353. Cited 6 times.  
[www.elsevier.com/locate/jad](http://www.elsevier.com/locate/jad)  
doi: 10.1016/j.jad.2020.05.046  
  
[View at Publisher](#)
- 
- 31 Sümen, A., Evgin, D.  
A cross-sectional study examining self-reported anthropometric measurements with adolescents' nutrition attitudes, obesity awareness and diet quality indices during the pandemic ([Open Access](#))  
  
(2022) *Journal of Pediatric Nursing*, 64, pp. 133-140. Cited 2 times.  
<http://www2.pediatricnursing.org/scripts/om.dll/serve?action=searchDB&searchDBfor=home&id=jpdn>  
doi: 10.1016/j.pedn.2022.01.018  
  
[View at Publisher](#)
- 
- 32 André, B., Canhão, H., Espnes, G.A., Ferreira Rodrigues, A.M., Gregorio, M.J., Nguyen, C., Sousa, R., (...), Grønning, K.  
Is there an association between food patterns and life satisfaction among Norway's inhabitants ages 65 years and older?  
  
(2017) *Appetite*, 110, pp. 108-115. Cited 24 times.  
<http://www.elsevier.com/inca/publications/store/6/2/2/7/8/5/index.htm>  
doi: 10.1016/j.appet.2016.12.016  
  
[View at Publisher](#)
- 
- 33 Vermeulen, E., Knüppel, A., Shipley, M.J., Brouwer, I.A., Visser, M., Akbaraly, T., Brunner, E.J., (...), Nicolaou, M.  
High-Sugar, High-Saturated-Fat Dietary Patterns Are Not Associated with Depressive Symptoms in Middle-Aged Adults in a Prospective Study ([Open Access](#))  
  
(2018) *Journal of Nutrition*, 148 (10), pp. 1598-1604. Cited 6 times.  
<http://jn.nutrition.org>  
doi: 10.1093/jn/nxy154  
  
[View at Publisher](#)
-

- 34 Liu, C., Xie, B., Chou, C.-P., Koprowski, C., Zhou, D., Palmer, P., Sun, P., (...), Anderson Johnson, C.  
Perceived stress, depression and food consumption frequency in the college students of China seven cities ([Open Access](#))  
  
(2007) *Physiology and Behavior*, 92 (4), pp. 748-754. Cited 159 times.  
[www.elsevier.com/locate/physbeh](http://www.elsevier.com/locate/physbeh)  
doi: 10.1016/j.physbeh.2007.05.068  
  
View at Publisher
- 
- 35 Sangsefidi, Z.S., Mirzaei, M., Hosseinzadeh, M.  
The relation between dietary intakes and psychological disorders in Iranian adults: A population-based study ([Open Access](#))  
  
(2020) *BMC Psychiatry*, 20 (1), art. no. 257. Cited 18 times.  
<https://bmcp psychiatry.biomedcentral.com/>  
doi: 10.1186/s12888-020-02678-x  
  
View at Publisher
- 
- 36 Głabska, D., Guzek, D., Groele, B., Gutkowska, K.  
Fruit and vegetable intake and mental health in adults: A systematic review  
  
(2020) *Nutrients*, 12 (1), art. no. 115. Cited 168 times.  
<https://www.mdpi.com/2072-6643/12/1/115/pdf>  
doi: 10.3390/nu12010115  
  
View at Publisher
- 
- 37 Fatemi, F., Siassi, F., Qorbani, M., Sotoudeh, G.  
Higher dietary fat quality is associated with lower anxiety score in women: A cross-sectional study  
  
(2020) *Annals of General Psychiatry*, 19 (1), art. no. 14. Cited 12 times.  
<http://www.annals-general-psychiatry.com>  
doi: 10.1186/s12991-020-00264-9  
  
View at Publisher
- 
- 38 Natacci, L., Marchioni, D.M., Goulart, A.C., Nunes, M.A., Moreno, A.B., Cardoso, L.O., Giatti, L., (...), Bensenor, I.M.  
Omega 3 consumption and anxiety disorders: A cross-sectional analysis of the brazilian longitudinal study of adult health (ELSA-Brasil)  
  
(2018) *Nutrients*, 10 (6), art. no. 663. Cited 15 times.  
<http://www.mdpi.com/2072-6643/10/6/663/pdf>  
doi: 10.3390/nu10060663  
  
View at Publisher
- 
- 39 Sanchez-Villegas, A., Henríquez, P., Figueiras, A., Ortuño, F., Lahortiga, F., Martínez-González, M.A.  
Long chain omega-3 fatty acids intake, fish consumption and mental disorders in the SUN cohort study ([Open Access](#))  
  
(2007) *European Journal of Nutrition*, 46 (6), pp. 337-346. Cited 139 times.  
doi: 10.1007/s00394-007-0671-x  
  
View at Publisher
-



□ 40 Ejike, C.

Association between anxiety and obesity: A study of a young-adult Nigerian population ([Open Access](#))

(2013) *Journal of Neurosciences in Rural Practice*, 4 (5 SUPPL), pp. S13-S18. Cited 8 times.

doi: 10.4103/0976-3147.116429

[View at Publisher](#)

---

🔍 Ibrahim, M.A.; Department of Nutrition Sciences, Kulliyah of Allied Health Sciences, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, Pahang, Kuantan, Malaysia; email:ariffib@iium.edu.my

© Copyright 2023 Elsevier B.V., All rights reserved.

---

## About Scopus

[What is Scopus](#)

[Content coverage](#)

[Scopus blog](#)

[Scopus API](#)

[Privacy matters](#)

## Language

[日本語版を表示する](#)

[查看简体中文版本](#)

[查看繁體中文版本](#)

[Просмотр версии на русском языке](#)

## Customer Service

[Help](#)

[Tutorials](#)

[Contact us](#)

---

## ELSEVIER

[Terms and conditions ↗](#) [Privacy policy ↗](#)

All content on this site: Copyright © 2024 Elsevier B.V. ↗, its licensors, and contributors. All rights are reserved, including those for text and data mining, AI training, and similar technologies. For all open access content, the Creative Commons licensing terms apply.

We use cookies to help provide and enhance our service and tailor content. By continuing, you agree to the use of cookies ↗.

