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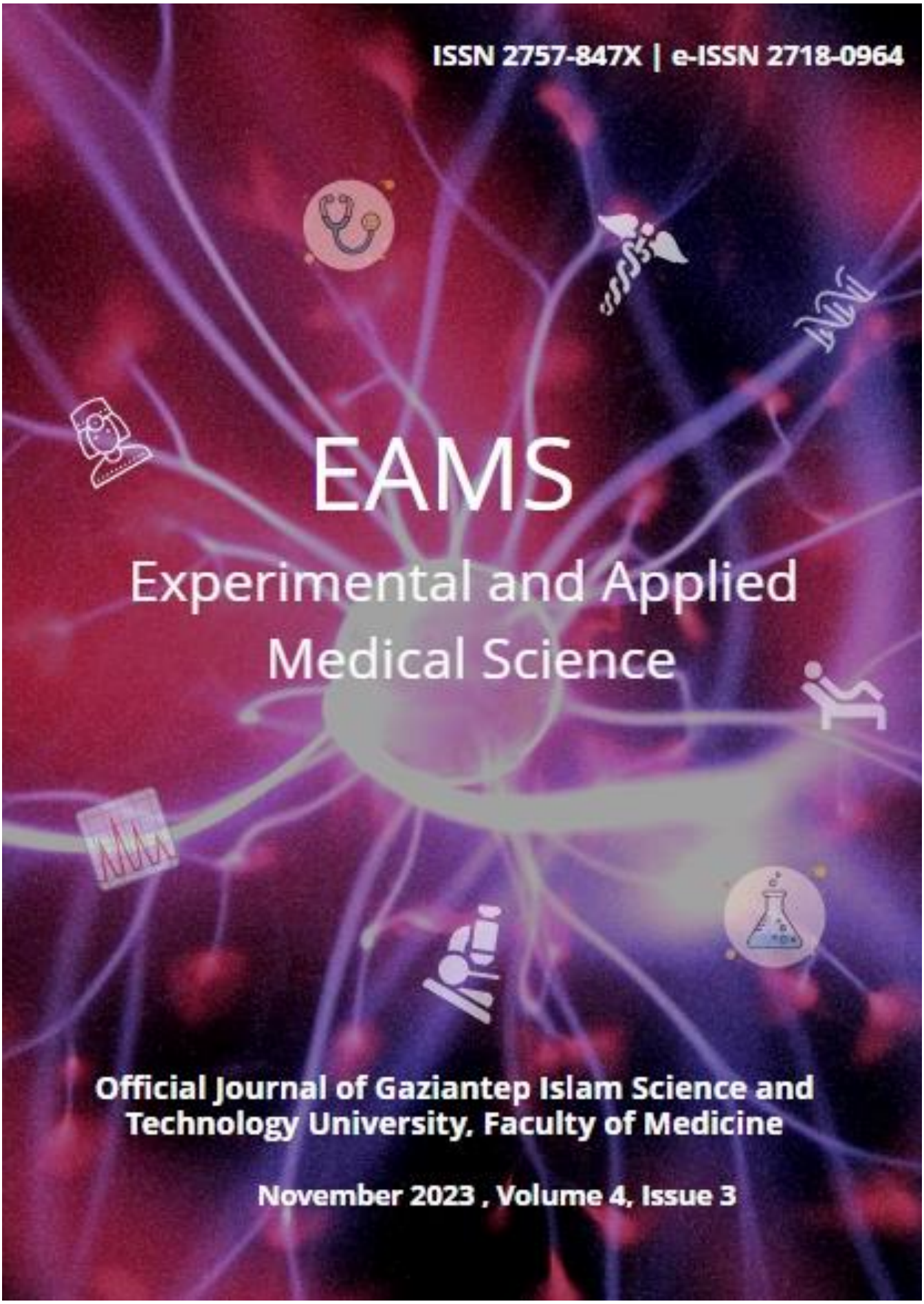

EAMS

Experimental and Applied Medical Science

Official Journal of Gaziantep Islam Science and Technology University, Faculty of Medicine

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GAZİANTEP İSLAM BİLİM VE TEKNOLOJİ ÜNİVERSİTESİ TIP FAKÜLTESİ

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Experimental and Applied Medical Science

Volume 4, Issue 3

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Contact information:

Gaziantep Islam Science and Technology University, Faculty of Medicine
Beştepe neighbouhood, Street number 192090 6/1 27010 Şahinbey/Gaziantep
Tel: +90 342 909 7500
E-mail: eams@gibtu.edu.tr

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On behalf of the Medical Faculty of Gaziantep Islam Science and Technology University
Gaziantep İslam Bilim ve Teknoloji Üniversitesi Tıp Fakültesi adına

Mehmet Tarakçıoğlu, Prof.

Chief Editor/Baş Editör

İbrahim Halil Türkbeyler, Prof.

Clerk of Editorial Office/Sorumlu Yazı İşleri Müdürü

Mehmet Göl, Asst. Prof.

Aim

Experimental and Applied Medical Science aims at being a current and easily accessible academic publication in which striking research results that will improve the quality of life and are unique from every field of medical sciences.

Amaç

Experimental and Applied Medical Science, yaşam kalitesini arttıracak çarpıcı araştırma sonuçlarının sunulduğu, tıp bilimlerinin her alanında benzersiz, güncel ve kolay erişilebilir bir akademik yayın olmayı hedeflemektedir.

Scope

Experimental and Applied Medical Science is an open-access, internationally double-blind peer reviewed academic medical journal which is published in English four times a year, under the auspices of Medical Faculty of Gaziantep Islam Science and Technology University. The journal receives manuscripts for consideration to be publishing in the form of research articles, reviews, letter to editor, brief notification, summary notification etc. which could have been presented from within the country or abroad and including experimental animal studies related to the pathogenesis of diseases, pharmacological, clinical, epidemiological and deontological studies, also studies in the fields of improving public health, health services or health insurance.

During evaluation or publication no charge is demanded from authors. The journal is published every 3 months (March, July, September and December) with 4 issues per year. The literary language of the journal is English. Abstract part of the manuscript only should also be submitted in Turkish.

Kapsam

Experimental and Applied Medical Science, Gaziantep İslam Bilim ve Teknoloji Üniversitesi Tıp Fakültesi himayesinde yılda dört kez İngilizce olarak yayınlanan açık erişimli, uluslararası çift kör hakemli bir akademik tıp dergisidir. Dergi, yurt içinden veya yurt dışından, hastalık patogenezleri ile ilişkili deneysel hayvan çalışmaları, klinik, farmakolojik, epidemiyolojik, deontolojik çalışmalar ile beraber halk sağlığının geliştirilmesi amacı taşıyan ve sağlık hizmetleri veya sağlık sigortaları konularında araştırma makaleleri, derlemeler, vaka sunumları, kısa bildirimleri, özet bildirimleri vs. yayınlamak için değerlendirmeye kabul etmektedir. Değerlendirme veya yayın sırasında yazarlardan herhangi bir ücret talep edilmez.

Dergi 3 ayda bir (Mart, Temmuz, Eylül ve Aralık) yılda 4 sayı olarak yayımlanır. Derginin yazı dili İngilizcedir. Makalenin sadece özet kısmı Türkçe olarak da gönderilmelidir.

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Manuscripts are only considered for publication provided that they are original, not under consideration simultaneously by another journal, or have not been previously published. Direct quotations, tables, or illustrations that have extracted from any copyrighted material must be accompanied by written authority for their use from the copyright owners. All manuscripts are subject to review by the editors and referees. Deserving to be publishing is based on significance, and originality of the material. If any manuscript is considered to deserve publishing, it may be subject to editorial revisions to aid clarity and understanding without changing the data presented.

Experimental and Applied Medical Science strictly adheres to the principles set forth by "Helsinki Declaration" whose web address is below.

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Editorial Board declares that all reported or submitted studies conducted with "human beings" should be in accordance with those principles.

Manuscripts presenting data obtained from a study design conducted with human participants must contain affirmation statements in the *Material and Methods* section indicating approval of the study by the institutional ethical review committee and "informed consent" was obtained from each participant. Also all manuscripts reporting experiments in which laboratory animals have been used should include an affirmation statement in the *Material and*

Etik İlkeler ve Yayın Politikası

Makaleler, orijinal/özgün olmaları, eş zamanlı olarak başka bir dergi tarafından incelenmemeleri veya daha önce yayınlanmamış olmaları koşuluyla yayına kabul edilir. Telif hakkıyla korunan herhangi bir materyalden alınan doğrudan alıntılar, tablolar veya resimler, kullanımları için telif hakkı sahiplerinden alınan yazılı izinle birlikte sunulmalıdır. Tüm yazılar editörler ve hakemler tarafından incelemeye tabidir. Yayınlanmaya hak kazanılması, materyalin önemine ve özgünlüğüne bağlıdır. Herhangi bir makalenin yayınlanmayı hak ettiği düşünülürse, sunulan veriler değiştirilmeden netlik ve anlayışa yardımcı olmak için editör revizyonlarına tabi tutulabilir.

Experimental and Applied Medical Science, internet adresi aşağıda yer alan "Helsinki Deklarasyonu" ile belirlenen ilkelere sıkı sıkıya bağlıdır.

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Editör Kurulu, "insan" ile yapılan tüm raporlanan veya sunulan çalışmaların bu ilkelere uygun olması gerektiğini beyan eder. İnsan katılımcılarla yürütülen bir çalışma tasarımından elde edilen verileri sunan makaleler, *Gereç ve Yöntemler* bölümünde çalışmanın kurumsal etik inceleme komitesi tarafından onaylandığını ve her katılımcıdan "bilgilendirilmiş onam" alındığını belirten onay ifadeleri kullanmalıdır. Ayrıca laboratuvar hayvanlarının kullanıldığı deneyleri bildiren tüm yazılar, *Gereç ve Yöntemler* bölümünde, internet adresi aşağıda

Methods section validating that all animals have received human care in compliance with the "Guide for the Care and Use of Laboratory Animals" whose web address is below and reveal approval by the institutional ethical review board. https://www.gibtu.edu.tr/Medya/Birim/Dosya/20210818130308_dca61056.pdf

If there is a commercial relation that contributes to the study process or there is an institution that provides financial support for the study; the authors must declare that they have no commercial relationship with the commercial product, drug, company used, or what kind of relationship (consultant or any other agreement) they have, if any.

Processing and publication are free of charge with the journal. No fees are requested from the authors at any point throughout the evaluation and publication process. All manuscripts must be submitted via the online submission system, which is available at https://dergipark.org.tr/tr/pub/eams. The journal guidelines, technical information, and the required forms are available on the journal's web page.

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belirtilmiş olan "Laboratuvar Hayvanlarının Bakımı ve Kullanımı Kılavuzu"na uygun olarak tüm hayvanların insanî bir bakım aldığını doğrulayan bir beyan ile kurumsal etik inceleme kurulunun onayını içermelidir. https://www.gibtu.edu.tr/Medya/Birim/Dosya/20210818130308_dca61056.pdf

Çalışma sürecine katkı sağlayan ticari bir ilişki veya çalışmaya maddi destek sağlayan bir kurum varsa; yazarlar ticari ürün, ilaç, aracılık eden şirket ile ticari bir ilişkilerinin olmadığını veya varsa ne tür bir ilişkisi (danışmanlık veya başka bir anlaşma) olduğunu beyan etmelidir.

Değerlendirme ve yayınlama süreçleri ücretsizdir. Değerlendirme ve yayın sürecinin hiçbir aşamasında yazarlardan ücret talep edilmez. Tüm yazılar https://dergipark.org.tr/tr/pub/eams adresinde bulunan çevrimiçi başvuru sistemi üzerinden gönderilmelidir. Dergi ile ilgili kullanım kılavuzları, teknik bilgiler ve gerekli formlar derginin internet sayfasında yer almaktadır.

Derginin tüm masrafları Gaziantep İslam Bilim ve Teknoloji Üniversitesi Tıp Fakültesi tarafından karşılanmaktadır. Reklam vermeyi düşüne kişi veya kurumlar yayın ofisi ile iletişime geçmelidir. Reklam görselleri sadece Baş Editör'ün onayı ile yayınlanabilir. Tüm araştırmacılar, makaleye doğrudan akademik veya bilimsel olarak katkıda bulunmuş olmalıdır. Yazarlar, makalenin planlanması, uygulanması, yazılması veya gözden geçirilmesi aşamalarından birine veya birkaçına katkıda bulunmuş olmalıdır. Tüm yazarlar nihai versiyonu onaylamalıdır. Bilimsel kriterlere uygun bir makale hazırlamak yazarların sorumluluğundadır.

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All manuscripts involving a research study must be evaluated in terms of biostatistics and it must be presented altogether with appropriate study design, analysis and results. ***p*** values must be given clearly in the manuscripts. Other than research articles, reviews, case reports, letters to the editor, etc. should also be original and up to date, and the references and, if any, their biostatistical parts should be clear, understandable and satisfactory.

The publication language of the journal is English. In addition, the abstract part of the article must be uploaded in both Turkish and English. Manuscripts should be evaluated by a linguist before being sent to the journal.

All manuscripts and editorial correspondence must be submitted online to the editorial office, https://dergipark.org.tr/tr/pub/eams.

According to the Law on Intellectual and Artistic Works, which was first published in the Official Gazette with the law number 5846 on 13/12/1951, whose web address is below, and on which subsequently various changes have been made or novel parts have been added in time, all kinds of publication rights of the articles accepted

Dergide yayınlanan yazılarda ifade edilenler veya görüşler, Gaziantep İslam Bilim ve Teknoloji Üniversitesi Tıp Fakültesi, editörler, yayın kurulu ve/veya yayıncının görüşlerini değil, yazar(lar)ın görüşlerini yansıtır; editörler, yayın kurulu ve yayıncı bu tür materyaller için herhangi bir sorumluluk veya yükümlülük kabul etmez.

Araştırma çalışması içeren tüm yazılar biyoistatistiksel açıdan değerlendirilmeli ve uygun çalışma düzeni, verilerin analizi ve sonuçları ile birlikte sunulmalıdır. ***p*** değerleri yazılarda açık olarak verilmelidir. Araştırma makaleleri dışında derlemeler, olgu sunumları, editöre mektuplar vb. de orijinal/özgün ve güncel olmalı, kaynaklar ve varsa biyoistatistiksel kısımlar açık, anlaşılır ve tatmin edici olmalıdır.

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Submission of a paper will be taken to imply that it has not previously been published and that it is not being considered for publication elsewhere. Decision as to publication of papers submitted to the Experimental and Applied Medical Science will be based on the opinion of the Editorial Board as to the significance and originality of the work.

Manuscripts should be prepared electronically using an appropriate “office word” compatible text-processing package, formatted for A4 size, double-spaced throughout, and using a “Times New Roman” 12 point font. Articles must be written in English. Abstracts must be written in both Turkish and English. Text should flush left, and not be justified. Words should not be hyphenated. Pages should be numbered sequentially.

There should be a separate title page with:

a) The title

b) The authors' names

c) The laboratory of origin, with complete address of each author

d) A running title

e) Corresponding author and e-mail

f) Conflict of interest

g) Acknowledgements

The main body of full-length paper should be divided into:

1. Abstract

2. Introduction

3. Material and Methods

4. Results

5. Discussion

Yazım Kuralları

Bir çalışmanın dergimize gönderilmesi için bu çalışmanın daha önce yayınlanmamış veya başka bir akademik dergide şu anda yayınlanmak üzere değerlendirilmiyor olması koşulu ile mümkündür. Experimental and Applied Medical Science’a gönderilen her türlü çalışmanın yayınlanmasına ilişkin karar, Yayın Kurulu'nun çalışmanın önemi ve özgünlüğü konusundaki görüşüne dayanacaktır.

Çalışmalar, ya “office word” programı ile ya da bu program ile uyumlu uygun bir metin işleme programı kullanılarak, A4 boyutunda hazırlanmalı, baştan sona çift aralıklı ve “Times New Roman” tarzında 12 punto yazı tipi kullanılarak elektronik ortamda yazılmalıdır. Makaleler İngilizce yazılmalıdır. Özetler hem Türkçe hem de İngilizce olarak yazılmalıdır. Metin iki yana yaslandırılmamalı, sadece sola yaslanmamalıdır. Kelimeler kısa çizgi ile hecelenmemelidir. Sayfalar sırayla numaralandırılmalıdır.

Aşağıdakileri içeren ayrı bir başlık sayfası olmalıdır:

a) Başlık

b) Yazarların isimleri

c) Her yazarın tam adresi ile birlikte çalıştıkları laboratuarlar

d) Kısa başlık

e) İletişimdeki yazar ve iletişim bilgileri

f) Çıkar çatışması beyanı

g) Teşekkür, bilgilendirme

Tam uzunluktaki kağıdın ana gövdesi şu bölümlere ayrılmalıdır:

1. Özet

2. Giriş

6. Conclusion
7. Conflict of interest
8. Acknowledgement
9. References

In general, there are no specific word lengths for any manuscript. The general principle is that a manuscript can be as long as necessary to communicate clearly and most effectively the scientific message, but should be as short as possible to achieve a complete presentation of the information without undue repetition or redundancy.

In the *Materials and Methods* section, the source of all compounds, equipment or software should be identified by the full name of the supplier, city, state/country. The chemical names of any drug should precede the trade name.

Papers describing animal experiments must define species, strain, sex, age, supplier and number of animals used. An ethical statement concerning the use of animals, or the details of ethical approvals, consent and recruitment of human subjects should be clearly stated. *Results* and *Discussion* can be broken down into subsections for improving the comprehensibility. The Results should not repeat methodological details and should avoid the discussion of the data.

The results of statistical tests should be incorporated in the body of the text, typically in the *Results* section, rather than in figure legends. Adequate description of statistical analysis should be provided. Statistical measures of variation in the text, illustrations and tables, should be identified. All dimensions and measurements must be

3. Gereç ve Yöntemler
4. Sonuçlar
5. Tartışma
6. Bağlam
7. Çıkar çatışması
8. Teşekkür, bilgilendirme
9. Kaynaklar

Genel olarak, herhangi çalışma için şart koşulan belirli bir kelime sayısı/metin uzunluğu yoktur. Genel ilke; bir makalenin bilimsel mesajı açık ve etkili bir şekilde iletmek için gerektiği kadar uzun olabileceği, ancak gereksiz tekrar veya fazlalık olmadan bilgilerin eksiksiz bir sunumunu elde etmek için mümkün olduğunca kısa olması gerektiğidir.

Gereçler ve Yöntemler bölümünde, tüm bileşiklerin, malzemelerin veya yazılımların kaynağı, tedarikçinin tam adı, şehir, eyalet/ülke ile tanımlanmalıdır. Herhangi bir ilacın kimyasal isimleri ticari isminden önce gelmelidir.

Hayvan deneylerini açıklayan makaleler, tür, soy, cinsiyet, yaş, tedarikçi ve kullanılan hayvan sayısını açıkça tanımlamalıdır. Hayvanların kullanımına ilişkin bir etik beyan veya insan deneklerin etik kurul onayları, bilgilendirilmiş onamları ve çalışmaya dâhil edilmelerine ilişkin ayrıntılar açıkça belirtilmelidir. *Sonuçlar ve Tartışma* bölümleri, anlaşılırlığı artırmak için alt bölümlere ayrılabilir. Sonuçlar, metodolojik ayrıntıları tekrarlamamalı ve verilerin tartışılmasından kaçınmalıdır.

İstatistiksel testlerin sonuçları, şekillerin altındaki açıklama kısımlarından ziyade metnin gövdesine, tipik olarak Sonuçlar bölümüne dâhil edilmelidir. İstatistiksel analizin yeterli bir şekilde açıklaması sağlanmalıdır. Metinde, resimlerde ve

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All subscripts, superscripts, Greek letters and unusual characters must be clearly identified.

In the text, abbreviations should be used consistently. Abbreviations should be defined on first use.

References should be designed in “Vancouver” style. While writing references, “Times New Roman” 10 point font should be used. Multiple authors should be separated by a comma. If there are more than three authors, after the 3rd author, "et al." should be inserted without a comma for both article and book references. If reference is made from a chapter in a book and there are many authors belonging only to this chapter, the title and chapter of the book are indicated, the first three of the chapter authors are written, and "et al." statement is added for subsequent authors.

Example:

1. Perell KL, Nelson A, Goldman RL, et al. Fall risk assessment measures: an analytic review. The journals of gerontology Series A, Biological sciences and medical sciences. 2001;56(12):M761-6.

2. Ha H, Han C, Kim B. Can Obesity Cause Depression? A Pseudo-panel Analysis. Journal of preventive medicine and public health = Yebang Uihakhoe chi. 2017;50(4):262-7.

3. Çekmen MB, Turgut M, Türköz Y, et al. Nitrik Oksit (NO) ve Nitrik Oksit Sentaz (NOS)'ınFizyolojik ve Patolojik Özellikleri. Türkiye Klinikleri Journal of Pediatrics. 2001;10(4):226-35.

4. Parlakpınar H, Örüm MH, Acet A. Kafeik asit fenetil ester (KAFE) ve miyokardiyal

tablolarda istatistiksel varyasyon ölçütleri tanımlanmalıdır.

Tüm boyutlar ve ölçüler metrik sistemde belirtilmelidir.

Tüm alt simgeler, üst simgeler, Yunan harfleri ve olağandışı karakterler açıkça tanımlanmalıdır.

Metinde kısaltmalar tutarlı bir şekilde kullanılmalıdır. Kısaltmalar ilk kullanımda tanımlanmalıdır.

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Örnek:

1. Perell KL, Nelson A, Goldman RL, et al. Fall risk assessment measures: an analytic review. The journals of gerontology Series A, Biological sciences and medical sciences. 2001;56(12):M761-6.

2. Ha H, Han C, Kim B. Can Obesity Cause Depression? A Pseudo-panel Analysis. Journal of preventive medicine and public health = Yebang Uihakhoe chi. 2017;50(4):262-7.

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5. Yıldırım AB. The effects of maternal hypothyroidism on the immunoreactivity of cytochrome p450 aromatase in the postnatal rat testes. 2015; Doctoral thesis.

6. https://hsgm.saglik.gov.tr/depo/birimler/kanserdb/istatistik/Trkiye_Kanser_statistikleri_2016.pdf (Last access date: 21.09.2020).

7. Kuran O, İstanbul, Filiz Kitabevi. Sistematik Anatomi. 1983 p. 76-9.

8. Abbas AK, Andrew H Lichtman, Shiv Pillai. Cellular and Molecular Immunology. 6th ed. Philadelphia: Saunders Elsevier; 2007 p. 121-56.

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Tables of numerical data should each be typed with double spacing on separate pages numbered in sequence in numerals, provided with a heading, and referred to in the text, as Table 1, Table 2, etc. Each table should have a brief but descriptive heading. Explanatory matter should be included in footnotes to the table.

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4. Parlakpınar H, Örüm MH, Acet A. Kafeik asit fenetil ester (KAFE) ve miyokardiyal iskemi reperfüzyon (Mİ/R) hasarı. İnönü Üniversitesi Sağlık Bilimleri Dergisi 2012; 1: 10-5.

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8. Abbas AK, Andrew H Lichtman, Shiv Pillai. Cellular and Molecular Immunology. 6th ed. Philadelphia: Saunders Elsevier; 2007 p. 121-56.

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Sayısal veri tablolarının her biri, sayılarla sırayla numaralandırılmış bir başlık ile birlikte ve metinde Tablo 1, Tablo 2, vb. olarak atıfta bulunulmuş halde, ayrı sayfalarda çift aralıkla hazırlanmalıdır. Her tablonun kısa ama açıklayıcı bir başlığı olmalıdır. Tablo dipnotlarında açıklayıcı hususlara yer verilmelidir.

Bilimsel araştırmalarınızı desteklemek ve geliştirmek için elektronik ek materyaller kabul edilmektedir. Ek dosyalar, yazara, destekleyici uygulamaları, filmleri, animasyon dizilerini, yüksek çözünürlüklü

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elzemdir. Yazarlar, makalelerinin yayımlanma tarihinden önce ortaya çıkabilecek ek çıkar çatışmalarını veya bulunan mali destekleri dergiye bildirmekle yükümlüdür. Tüm yazarlar, makalelerinin konusuyla doğrudan ilgili olsun ya da olmasın, tüm olası çıkar çatışmalarını ve mali desteği bireysel olarak açıklamalıdır.

görüntüleri, arka plan veri kümelerini, ses kayıtlarını ve daha fazlasını yayınlamak için ek olanaklar sunmaktadır.

Başvuru sırasında çıkar çatışmasının ve mali destek konularının açıklanması

Abdullah Tuncay Demiryürek, Prof.
Gaziantep University, Medical Faculty, Pharmacology Department
demiryurek@gantep.edu.tr

Ahmet Kayraldız, Prof.
Kahramanmaraş Sütçü İmam University, Science and Literature Faculty, General Biology Department
akayraldiz@ksu.edu.tr
Mahshid Hodjat
Tehran University of Medical Science
mhodjat@tums.ac.ir
Yasuo Yanagi
Asahikawa Medical University, Ophtalmology Department
yasuoyanagi@asahikawa-med.ac.jp
Mehmet Şahin, Prof.
Gaziantep University, Medical Faculty, Medical Biology Department
msahin.sahin44@gmail.com
İbrahim Halil Türkbeyler, Assoc. Prof. Dr. Ersin Arslan Training and Research Hospital, Geriatrics Department
ihturkbeyler@gmail.com
Ayşegül Burçin Yıldırım, Asst. Prof.
Gaziantep Islam, Science and Technology University, Medical Faculty, Medical Histology and Embryology Department
abyildirim@gibtu.edu.tr
Mediha Begüm Kayar, Asst. Prof.
Gaziantep Islam Science and Technology University, Medical Faculty, Medical Microbiology Department
begumkayar@gmail.com
İbrahim Halil Kenger, Asst. Prof.
Gaziantep Islam Science and Technology University, Medical Faculty, Medical Genetics Department
ibrahimhalil.kenger@gibtu.edu.tr
Cuneyd Parlayan, Asst. Prof.
Bahçeşehir University, Medical Faculty, Bioistatistics and Medical Informatics Department
cparlayan@medipol.edu.tr
Masa-Aki Ikeda
Tokyo Medical and Dental University, Garduate School of Medical and Dental Science
mikeda.emb@tmd.ac.jp
Maizaton Atmadini Abdullah

fzt_meralaksehir@hotmail.com
Zekiye İpek Katırcı Kırmacı, Asst. Prof.
Gaziantep Islam Science and Technology University, Faculty of Health Sciences
ipek.kirmaci@gibtu.edu.tr
Gönül Elpeze, Asst. Prof.
Gaziantep Islam Science and Technology University, Faculty of Health Sciences
gonul.elpeze@gibtu.edu.tr
Nassim Parsa
parsanaslim@gmail.com
Hadi Yadiavari
hadyyadiavari@gmail.com
Mohamadal Mahmoudibashar
mahmoudmohamadalmobashar@gmail.com

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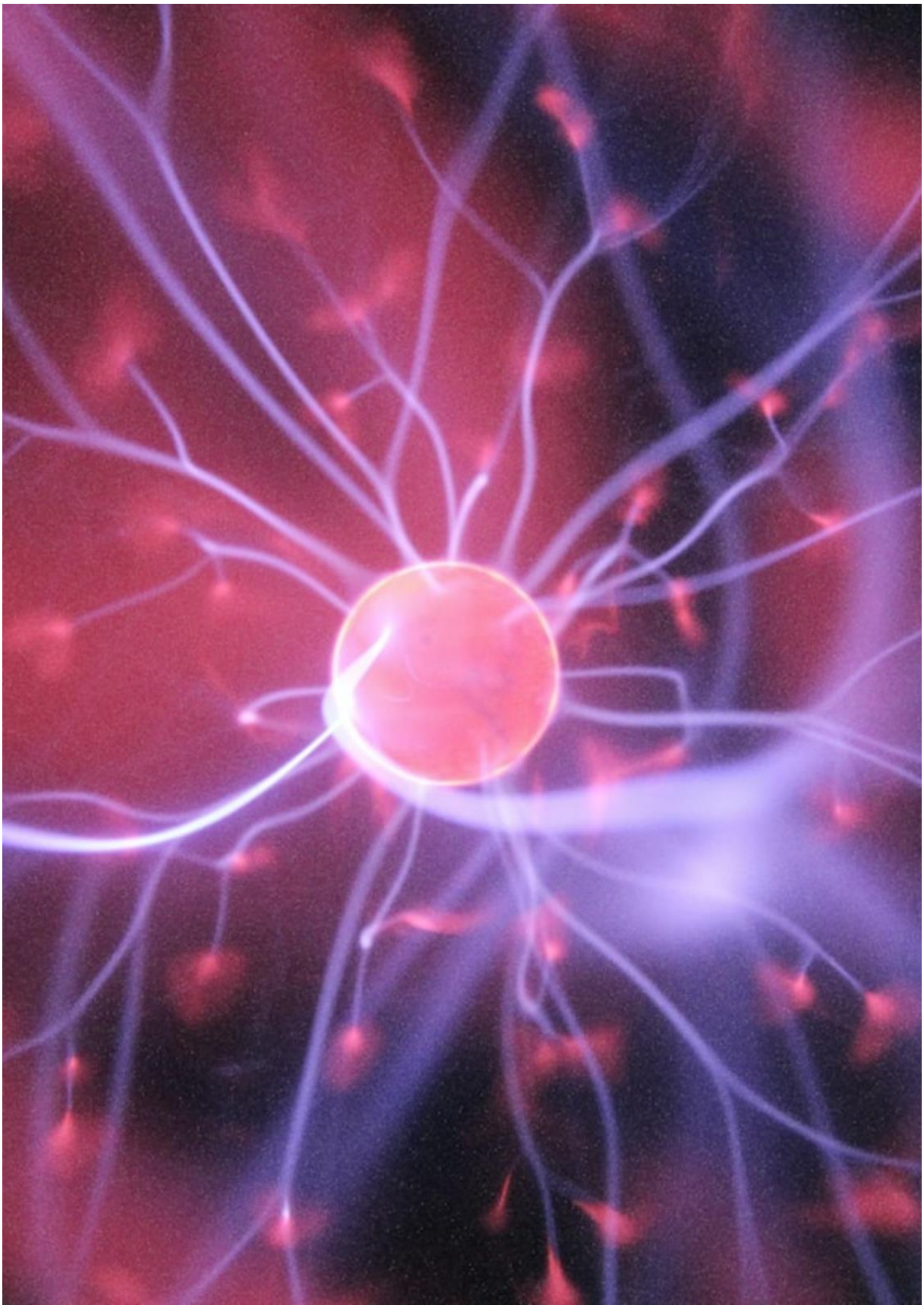

Editorial Letter

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Vaccination Refusal During Pandemic Period

Serdar ÖZDEMİR[1*]

[1] *Unıversıty Of Health Scıences, İstanbul Ümraniye Health Research Center, İstanbul, Turkey.*

Dear Editor,

Understanding the reasons behind vaccination refusal is crucial in formulating effective strategies to address this issue. A study investigating COVID-19 vaccine rejection based on the World Health Organization's 3C model, as proposed by the Vaccine Rejection Working Group (SAGE) in Malaysia, identified doubt regarding vaccine efficacy and safety as the most prevalent cause of refusal (1). The 3C model comprises confidence (trust in the vaccine), complacency (perceived necessity of the vaccine), and convenience (accessibility and suitability for the vaccine). Misinformation, particularly fueled by conspiracy theories and myths, was highlighted as a significant factor contributing to vaccine rejection (2).

Some individuals cast doubt on the existence of COVID-19, propagating conspiracy theories such as its connection to 5G technology, falsification of COVID-19 data by authorities, and the notion of COVID-19 being a biological weapon. Additionally, concerns about vaccines being linked to autoimmune diseases and autism persist. Alarmingly, these conspiracy theories can find support from healthcare professionals and authorities. Addressing this aspect of vaccine rejection requires evaluation, and concerted efforts are needed to promote reliable and verifiable information sources to counteract vaccine hesitancy effectively.

A 2021 study delved into the causes of COVID-19 vaccine rejection and factors influencing vaccine acceptance (3). While higher education levels were associated with increased vaccine refusal, there is no unanimous consensus in the literature. Individuals with higher education backgrounds might encounter more misinformation due to their reliance on critical thinking and selective information sources. Contrasting findings indicate that learning about vaccination from medical publications was more prevalent among high school graduates and above, while social media was a common source for those with varying educational backgrounds.

In a meta-analysis of 4299 publications examining factors affecting COVID-19 vaccine rejection, individuals with a master's degree were found to be at a lower risk of vaccine refusal compared to those without such qualifications (4).

In conclusion, vaccine refusal poses a global public health challenge, particularly highlighted during the COVID-19 pandemic. Regardless of societal or individual education levels, adopting an inclusive, evidence-based information policy is imperative. Educating students in medical faculties and health vocational schools about vaccine refusal and transferring their experiences to the next generation of healthcare professionals is crucial.

*Corresponding author: Serdar Özdemir, E-mail: dr.serdar55@hotmail.com, ORCID ID: 0000-0002-6186-6110.

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Original article

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Investigation of The Antibacterial Activities of Micromeria Congesta and Some Other Plant Extracts

Fuat Serkan KAPUCUK[1*], Muhammed Yaşar DÖRTBUDAK[2], Ahmet Murat SAYTEKİN[3], Hikmet DİNÇ[4]

[1]*Harran University, Faculty of Veterinary Medicine, Department of Pharmacology and Toxicology, Şanlıurfa, Turkey*

[2]*Harran University, Faculty of Veterinary Medicine, Department of Preclinical Sciences, Department of Fisheries and Diseases, Şanlıurfa, Turkey*

[3]*Harran University, Faculty of Veterinary Medicine, Department of Preclinical Sciences, Department of Microbiology, Şanlıurfa, Turkey*

[4]*Gaziantep Islamic Science and Technology University, Faculty of Medicine, Department of Medical Pharmacology, Gaziantep, Turkey*

Abstract

With the Covid-19 pandemic, interest in plants and herbal products has increased day by day. The tendency of people towards natural treatment methods has led to more studies on plants and herbal products. The aim of our study was to determine the essential oils of Micromeria congesta, Rosmarinus officinalis L., Sideritis stricta, Artemisia absinthium and Melissa officinalis, which are used in the treatment of various diseases among the people, to evaluate the in vitro antimicrobial activity against Klebsiella pneumoniae, Escherichia coli, Salmonella Typhimurium, Proteus vulgaris, Staphylococcus aureus isolates and Corynebacterium pseudotuberculosis (ATCC 19410) standard strain. The essential oils of M. congesta and M. officinalis plants examined in our study were found to have antibacterial activity as much as reference antibiotics (Streptomycin, Amoxicillin) by disc diffusion method. It was observed that the essential oil of A. absinthium was effective against C. pseudotuberculosis bacteria, while the essential oils of other plants were not effective against the tested bacteria.

***Key words**: Micromeria congesta, medicinal plant, essential oil, antibacterial activity*

*Corresponding author: Fuat Serkan Kapucuk, E-mail: fuatser07@hotmail.com, ORCID ID: 0000-0001-9037-0125

Introduction

In the past, people first used plants to treat their diseases. The use of plants and herbal products for different purposes dates back to ancient times. In line with scientific studies and commercial purposes, plants are used in many fields such as phytotherapy, aromatherapy, cosmetics and food industry (1). The use of herbal products, which have become popular especially in recent years, in the treatment of various diseases continues to increase today as in the past (2). The intensive use of medicinal plants, which are considered to be natural and healthy, may also cause some negative effects. It is important to use these plants under the control of a doctor or specialist. While the increase in the use of antibiotics and the development of resistance in bacteria against antibiotics is increasing day by day, no such resistance development is observed in herbal products with antibacterial activity. This important feature further increases the importance of herbal products (3).

The use of plants and herbal products for therapeutic purposes varies according to the level of development of countries. In developing countries, 80% of people treat their illnesses with herbal products; in some countries in the Middle East, Asia and Africa, this rate rises to 95%. This rate is lower in developed countries. For example, this rate is 40-50% in Germany, 42% in the USA, 48% in Australia and 49% in France (2). No data could be obtained on the rate of use of medicinal plants and herbal products used for treatment in our country.

It has been demonstrated in different studies that extracts and essential oils of some plants growing naturally in nature show antibacterial activity against bacteria (4). While some plants with various therapeutic effects are successfully used especially in wound treatments, harmful effects may occur in others depending on the amount of use, route and form of exposure (5-6).

Extracts obtained from plants such as fixed oils, essential oils, gums, resins, etc. are used in the treatment of various diseases of both animals and humans (7). Essential oils are volatile and oil-like compounds obtained from plants or plant sources by water or water vapor distillation method (Hydrodistillation-Clevenger apparatus), which are liquid under normal conditions, sometimes freezable, with strong odor. Essential oils can be found in all organs of plants. Sometimes they can be found in all tissues of coniferous plants such as pine trees. Essential oils can be found in secretory pockets, a specific organ, secretory hairs, secretory ducts or secretory cells, varying according to the family to which the plant belongs (8).

Micromeria congesta grows naturally in the mountainous areas of Şanlıurfa, Gaziantep and Adıyaman provinces and is locally known as "Dağ nanesi", "Kaya nanesi", "Gihaye paluk", "Punge tehta", "Punk". The plant itself, its roots or above-ground parts are reported to be boiled or made into tea and drunk by the local people. It has been reported that it is used in respiratory tract disorders and cough treatment, its extract and essential oil have antimicrobial and antioxidant properties, and it is used in traditional folk medicine as antiseptic, antirheumatic, CNS stimulant and painkiller in toothache (9-10).

Rosmarinus officinalis L. is an important medicinal and aromatic plant growing naturally in Türkiye. It is also known by different names such as "kuşdili", "pürem", "hasalban", "urum çiçeği" and "akpüren" (11). In the ancient Greek and Roman periods, rosemary was used both for therapeutic purposes as a medicinal plant and for flavoring dishes in the kitchen. It has been reported that it was used especially to strengthen concentration and memory in ancient Greek times, and it was also included in some folk medicines due to its mild stimulant effect. In addition, rosemary

plant was used by burning in the environment during the Second World War in the prevention of infectious diseases, in the treatment of various diseases and in cleaning the air of patient rooms (12). Ottoman physicians stated that rosemary tea "beautifies the complexion". For this effect, they reported that either the tea should be drunk or the cream made by crushing rosemary and mixing it with butter should be used (13).

Sideritis stricta is a member of the Lamiaceae family. The genus Sideritis is represented by more than 150 species, 46 of which are found in Türkiye, and is distributed in the Mediterranean region. *S. stricta* is locally called "mountain tea", "highland tea" or "island tea" in Anatolia. It is consumed by the people as herbal tea in gastrointestinal disorders and in the treatment of colds (14). Since ancient times, the essential oils in the tea prepared from *S. stricta* have been used as folk medicine due to their physiological effects such as stimulant, carminative, digestive, stomach pain relief and appetizing due to tannins and bitter substances (15).

Artemisia absinthium L. is a perennial shrubby plant belonging to the Asteraceae family that grows along riversides, fields, slopes and steppes. Locally known as "wormwood", "bitter wormwood", "white wormwood", "great wormwood", A. absinthium grows naturally in different parts of Anatolia. It is used by local people as antipyretic, antiseptic, antihelminthic, tonic, diuretic and in stomach disorders (11,16-17). It has been reported that if it is boiled with water and drunk on an empty stomach, it is good for diabetes, delays menstruation, relieves gas and stimulates appetite (18).

Melissa officinalis L. plant belongs to the Lamiaceae family and grows naturally in the Aegean and Marmara regions of Türkiye. The leaves of lemon balm, which is especially effective on the nervous system, are used medicinally (19). Lemon balm tea is used in treatment due to its sedative, stomachic, carminative, diaphoretic and antiseptic effects. It has also been reported to be used in some regions for the treatment of depression, migraine, asthma, heart diseases, diabetes and bronchitis (20).

The aim of this study is to investigate the antibacterial activity of essential oils of some plants that are used for therapeutic purposes among the people and whose popularity has increased especially with the Covid-19 outbreak. The plants we will use in our study are *M. congesta, R. officinalis, S. stricta, A. absinthium* and *M. officinalis*.

Materials and methods

Plants and Essential Oils

M. congesta was collected from the Tektek mountains within the borders of Şanlıurfa province, *R. officinalis* was collected from the aromatic plant field at GAPTAEM Koruklu station and *S. stricta* was collected from the mountainous areas of Alanya. These plants were collected from their natural habitat and dried in June-July 2023. *A. absinthium* and *M. officinalis* plants were obtained from herbalists in dried and ready to use plastic bags. The essential oils of the plants were obtained by hydrodistillation for 6-8 hours in August using Clevenger apparatus. Different ratios of essential oil were obtained from each of the plants in our study. The essential oils were stored in dark glass bottles at +4 °C (10, 21). Dimethyl sulfoxide (DMSO) was used for homogeneous mixing of stock solutions of essential oils. Essential oil was added into DMSO at a ratio of 1:2 (v:v) to dissolve the essential oils. The mixture of essential oil and DMSO was vortex mixed at 180 rpm for 10 minutes. The stock solutions were stored in the refrigerator at +4 ^{o}C (22).

Tested Microorganisms

The bacteria used for antibacterial activity were obtained from the strain collection of Harran University, Faculty of Veterinary Medicine, Department of Microbiology

Laboratory. *Klebsiella pneumoniae, Escherichia coli, Salmonella* Typhimurium, *Proteus vulgaris* and *Staphylococcus aureus* test strains isolated from clinical samples at various times and included in the strain collection were used in our study. *Corynebacterium pseudotuberculosis* (ATCC 19410), also included in the collection as a standard strain, was used as a test strain in the study.

In Vitro Antimicrobial Activity Test

Since no standard test has been developed to evaluate the antimicrobial activity of essential oils against microorganisms, the Clinical and Laboratory Standards Institute (CLSI) method for antimicrobial susceptibility testing was used to test essential oils (22).

Agar Disc Diffusion Method

Evaluation of the essential oils in our study in terms of antimicrobial activity was performed by disc diffusion method (22-23). Bacterial cultures maintained in Trypticase Soy Broth (TSB) with 15% glycerin at -20 ^{o}C were reconstituted according to McFarland 0.5 after revitalization. Mueller Hinton Agar (MHA) was inoculated with 100 µl. After thorough spreading, the growth medium were allowed to dry (22).

Sterile filter discs (6 mm diameter) (Himedia, India) were saturated with 10 µl of stock solutions of essential oils. The impregnated discs were allowed to rest at room temperature for 30 min. Then, all discs were placed on the agar surface with bacterial cultures at regular intervals using forceps dipped in ethanol. Petri dishes were left at room temperature for 30 minutes for oil diffusion and then incubated at 37°C for 24 hours. DMSO was used as a negative control and Streptomycin and Amoxiline impregnated 6 mm diameter prepared discs (Bioanalyse, Türkiye) were used as positive controls. After incubation, inhibition zones formed around the discs were measured in millimeters and recorded (22).

Results

After 24 hours of incubation, antibacterial activity is shown in Table 1 and Figure 1.

Table 1. Antibacterial activity of the essential oils tested

Essential Oils, Antibiotics and DMSO	Tested Bacteria and Diameters of Inhibition (mm)*					
	Klebsiella pneumoniae	*Staphylococcus aureus*	*Escherichia coli*	*Salmonella* Typhimurium	*Proteus vulgaris*	*Corynebacterium pseudotuberculosis*
Melissa officinalis	10 mm	9 mm	7 mm	8 mm	8 mm	20 mm
Micromeria congesta	9 mm	11 mm	7 mm	8 mm	8 mm	20 mm
Sideritis stricta	-	-	-	-	-	-
Rosmarinus officinalis	-	-	-	-	-	-
Artemisia absinthium	-	-	-	-	-	12 mm
Streptomycin	-	10 mm	12 mm	-	8 mm	-
Amoxicillin	-	14 mm	-	12 mm	10 mm	26 mm
DMSO	-	-	-	-	-	-

*Diameter of discs included. (< 6 mm diameter length was considered as no inhibition)

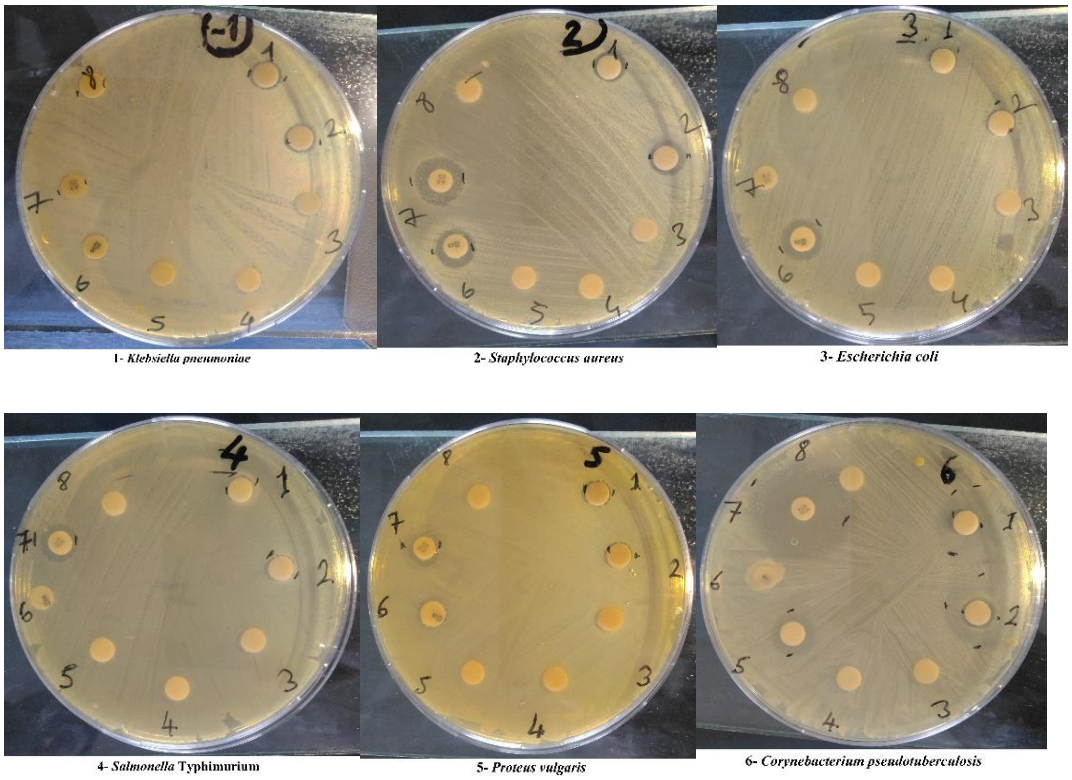

Figure 1. Antibacterial Activity Test of Essential Oils
(1. *M. officinalis* 2. *M. congesta* 3. *S. stricta* 4. *R. officinalis* 5. *A. absinthium* 6. Streptomycin 7. Amoxicillin 8. DMSO)

It was observed that the essential oils of *M. congesta* and *M. officinalis* plants tested in our study had antibacterial activity as much as reference antibiotics by disk diffusion method. It was observed that the essential oil of *A. absinthium* was effective against *C. pseudotuberculosis* bacteria, while the essential oils of other plants were not effective against the tested bacteria. As a negative control, DMSO solvent did not produce any inhibition zone against the tested strains.

Discussion

In recent years, microorganisms have developed resistance to some antibiotics used in the treatment of infectious diseases, making treatment difficult or prolonging the treatment process. The development of resistance in microorganisms may cause antibiotics to be ineffective in treatment. As a result, morbidity and mortality rates increase and cause great economic losses. The side effects of existing synthetic antibiotics and the increase in resistant bacterial species have led to increased studies on new antibacterial agents with fewer side effects (24).

In our study, it was observed that the essential oils of *M. congesta* and *M. officinalis* plants were antibacterial against the six bacterial strains tested at different levels, while the essential oil of *A. absinthium* plant was antibacterial only against *C. pseudotuberculosis* bacteria.

It has been reported that aromatic plants and essential oils of these plants have antibacterial, antiviral, antifungal, anti-inflammatory, antioxidant, antiseptic, antiparasitic, insecticidal and antitoxigenic effects and are also effective against microorganisms that have acquired resistance to antibiotics (25).

In a study, the antibacterial and antioxidant effects of *M. officinalis* essential oil were investigated. It was reported that Gram-

negative pathogenic bacteria such as *P. aeruginosa, E. coli, S. enteritidis, S.* Typhi and *Shigella* strains, especially those with multiple resistance development, showed a remarkable sensitivity to *M. officinalis* essential oil (26).

In another study in which the chemical structure and antimicrobial activity of the essential oil obtained from *M. officinalis* plant were examined, it was reported that the essential oil had different and complex chemical components. They also revealed that it had inhibition zones against all tested bacteria and showed strong antimicrobial activity with minimum inhibitor concentration (27).

In another study, the chemical composition, antioxidant potential, total phenolic content and antimicrobial activity of *M. officinalis* essential oil were investigated. It was reported that *M. officinalis* essential oil has antibacterial activity on the growth of commercial and clinical strains causing infections. They observed that gram positive bacteria were more sensitive than gram negative bacteria. They reported that bactericidal activity increased as the concentration increased (28).

In a study, the antibacterial activity of *M. congesta* essential oil and donkey milk was investigated in *E. coli* strains isolated from Urfa cheeses and developed multiple antibiotic resistance. As a result of the study, it was reported that *M. congesta* essential oil and donkey milk had higher antibacterial activity compared to reference antibiotics (tetracycline and streptomycin) (21).

In another study, the chemical composition, antimicrobial activity, total antioxidant activity, total phenol content and total oxidant status of the essential oil obtained from *M. congesta* plant were investigated. As a result of the study, it was reported that the essential oil had significant antibacterial activity and antioxidant activity compared to reference antibiotics (29).

In a study examining the chemical composition and antimicrobial activity of *A. absinthium, Artemisia scoparia* and *Artemisia sieberi* essential oils, it was reported that the essential oils of each plant had antibacterial activity against the tested bacteria depending on the concentration (30).

In another study in which the phytochemical content, antioxidant and antibacterial activities of *A. absinthium* plants collected from different regions of Tunisia were examined, it was found that the essential oil of the plant interestingly inhibited the growth of both Gram-negative and Gram-positive bacterial strains. It was reported that the essential oil of *A. absinthium* plant collected from Zaghouan region exhibited a significant inhibitory effect against *E. coli* strain with an inhibition zone of 31 mm (31).

It was observed that the antibacterial activity of the essential oils of *M. officinalis*, *M. congesta* and *A. absinthium* plants examined in our study was compatible with the literature studies. The reasons for the lack of antibacterial activity of essential oils of *S. stricta* and *R. officinalis* plants may be insufficient concentration, volatilization of essential oils in contact with air, or insensitivity to selected bacterial strains.

Conclusion

As a result, it was observed that the essential oils of *M. officinalis, M. congesta* and *A. absinthium* plants had antibacterial activity against the tested bacteria. These results show that essential oils obtained from plants can be used in the treatment of infectious diseases and traditional medicine in the future. According to the results obtained, the essential oils we examined showed different antibacterial activities. This study is important for determining the plants that grow naturally or are cultivated and have medicinal properties in our country, which has a rich plant flora. Our study will contribute to the development of

antibacterial agents in the fight against infectious diseases and will contribute to future research. More research is needed to identify the components of essential oils and reveal their effects.

Conflict of interest

The authors declare that they have no conflict of interest.

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The Investigation Relation Between Body Mass Index and Physical Activity Level in Adult Patients with Chronic Stroke

Sedef Çayır Kılınç[1], Tülay Tarsuslu [2*]

[1]*İzmir Tire Devlet Hastanesi, Fizik Tedavi ve Rehabilitasyon Departmanı, Tire, İzmir, Türkiye*

[2] *Dokuz Eylül Üniversitesi Fizik Tedavi ve Rehabilitasyon Fakültesi, İnciraltı, İzmir, Türkiye*

Abstract

The aim of this study was to investigate body weight changes and the correlation between body mass index and physical activity level in adult hemiplejic patients after stroke. The study included 70 adults suffered from stroke (with hemiplegia) at least 1 year ago and 70 healthy volunteered people who accompanied them. The social-demographic informations of the participants were recorded. Body weight chages of the patients were asked and recorded. According to the height and weight measurements, body mass index (BMI) was calculated. Physical activity level was measured with International Physical Activity Questionnaire (IPAQ). The ratio of overweight/obese subjects were 34.3% and 30% in hemiplegic and healthy subjects, respectively. In the statistical analyses there was no statistically difference between the groups in respect to BMI ($p>0.05$). It was found that 55.7% of the hemiplegic patients have weight gain. In correlations analyses, there was negative correlations between BMI and physical activity level (IPAQ) ($p<0.05$). Physical activity level was lower in overweight/obese patients ($p<0.05$). In post-stroke chronic phase, patients with hemiplegia tent to gain weight. Decrease in physical activity level and sedantary lifestyle can result with negative weight change. Physical activity level should be increase in patients with hemiplagia after stroke.

***Key words**: Stroke, obesity, physical fitness, physical activity*

*Corresponding author: Tülay Tarsuslu, E-mail: tulay_tarsuslu@yahoo.com, ORCID ID: 0000-0003-3797-8857

Introduction

Stroke is a major clinical event that is the second leading cause of death in people over 60 years of age and causes disability in adults. The World Health Organization reports that globally, a new stroke occurs every 2 seconds and a death or disability from stroke occurs every 6 seconds (1).

Overweight and obesity are among the modifiable risk factors of stroke and in recent years, it has become an important health problem that needs to be combated because of its increasing incidence and increasing mortality and morbidity rates (2,3). Obesity is among the important risk factors of ischemic stroke and especially affects young individuals. Studies have shown that each unit increase in body mass index (BMI) increases the likelihood of ischemic stroke by 6%, regardless of gender (4-6).

Weight gain, increases the risk of stroke, but cerebrovascular events such as stroke may also affect weight change. Stroke can alter nutritional status and body composition by affecting feeding difficulties and mobility. Although underweight is a problem that can be observed in the acute and chronic period after stroke, information on the change in body composition is quite limited (7,8). Although cachexia and weight loss are among the problems encountered as an important problem after stroke, weight gain and obesity can also be seen significantly as negative effects of physical activity level and dietary habits (9,10). In studies, it has been reported that patients experience weight loss after stroke and this is due to conditions such as malnutrition, inactivity and paralysis (11,12). Malnutrition and inadequate protein intake cause weight loss, decreased muscle mass and sarcopenia in stroke patients over time (13). These changes that occur over time seriously affect the mortality rate in patients with stroke. On the other hand, being physically inactive, being of advanced age and poor eating habits may result in body fat and weight gain in the post-stroke period (14,15). In the literature, it is emphasized that there is a need for studies on weight and body composition changes occurring in acute and chronic periods after stroke in patients with stroke (7-9). This study, which was planned based on previous studies, had 2 aims. The first one is to examine the change in body weight in adult hemiplegic patients after stroke and the second one is to examine the relationship between body mass index and physical activity level.

Material and method

The study was conducted with hemiplegic individuals aged 18 years and older with a diagnosis of hemiplegia for more than 1 year who applied to Tire State Hospital Physical Therapy and Rehabilitation Outpatient Clinic and received outpatient or inpatient treatment, and healthy volunteers. The healthy volunteers who participated in the study were the relatives of the patients who accompanied the hemiplegic individuals and met the inclusion criteria. The inclusion criteria were as follows: having a diagnosis of hemiplegia for more than one year, being 18 years of age or older, being able to walk at least 10 meters with or without assistance, and being cooperative enough to answer the questions appropriately. Inclusion criteria for healthy individuals were to volunteer, not to have any neurological and/or orthopedic problems, and to be cooperative. Exclusion criteria for healthy volunteers were defined as having other neurologic disorders accompanying hemiplegia and having cognitive communication problems. In this study, hemiplegic patients were defined as group 1 and healthy individuals as group 2.

In the power analysis performed to determine the total number of participants, when calculated with an effect size of 0.25 (Cohen's d), 80% power and a margin of error of 0.05, the total number of participants was determined as 100

individuals, 50 for each group. However, it was aimed to increase this number considering the possibility of individuals who did not want to complete the evaluation programs or who wanted to drop out of the study at the last moment. The study included 70 hemiplegic individuals and 70 healthy volunteers who met the inclusion criteria. In this study, hemiplegic individuals were defined as group 1 and healthy volunteers as group 2. The evaluations were performed by the researcher physiotherapist working in the Physical Therapy and Rehabilitation Department of Tire State Hospital. The evaluation forms used in the study were completed by face-to-face interview method.

Individuals who voluntarily agreed to participate in the study were explained in detail about the evaluation to be performed and signed an informed consent form. Dokuz Eylül University Faculty of Medicine Ethics Committee was applied for this study and the necessary ethics committee permission was obtained (decision 2013/32-15 with protocol number 1118-GOA).

In the study, height was determined with a standard tape measure and body weight was determined with a Fakir Hercules scale and body mass index (BMI) values were calculated. Height was assessed with a barefoot wall tape. BMI was obtained by dividing body weight by the square of the height in meters (kg/m2). As a result of the measurements obtained, individuals with a BMI value < 18.5 kg/m2 were considered underweight, those with a BMI of 18.5 ≤ BMI < 25 kg/m2 were considered normal, those with a BMI of 25 kg/m2 ≤ BMI >30 kg/m2 were considered overweight and those with a BMI of 30 kg/m2 ≤ BMI were considered obese (16).

The general descriptive characteristics (socio-demographic), clinical characteristics and the dates of the stroke event, whether they gained weight after the stroke, and if so, how much weight they gained were asked and recorded on the evaluation form.

The physical activity level of the individuals was evaluated with the International Physical Activity Questionnaire (IPAQ). The Turkish validity and reliability study of the scale was conducted by Öztürk et al. (17). The questionnaire has eight forms, four short and four long forms. IPAQ questionnaire scoring and score: The short form (7 questions) provides information about the time spent in sitting, walking, moderate and vigorous activities in the last 7 days. The calculation of the total score of the short form includes the sum of duration (minutes) and frequency (days) of walking, moderately vigorous activity and vigorous activity. The sitting score (level of sedentary behavior) is calculated separately. The energy required for the activities is calculated as MET-minutes score. Standard MET values have been established for these activities. Walking = 3.3 METs; moderate physical activity = 4.0 METs and vigorous physical activity = 8.0 METs. Daily and weekly physical activity scores are calculated using these values (16). The IPAQ score was determined according to the data obtained from the individuals (walking times, physical activities, sedentary life span).

Statistical analysis

In the study, variables determined by measurement were expressed as arithmetic mean ± standard deviation (X±SD). Distributions (%) were calculated for variables determined by counting. Comparison of the numerical data of the groups that did not show normal distribution was performed using the Mann-Whitney U test. Comparisons were expressed as median (med-min-max) and SD values were presented as descriptive in the tables. In addition, Spearman correlation analysis was used to examine the relationship between variables.

Statistical analyses of the study were performed with Statistical Package for Social Science for Windows (SPSS) version 20.0 Statistical Program. $p<0.05$ was considered statistically significant (18).

Results

The duration of hemiplegia (post-stroke period) was 44.1±34.1 (12-180 months) months in hemiplegic individuals who participated in the study. 28 (40%) of the patients were diagnosed with ischemic stroke and 42 (60%) with hemorrhagic stroke. There was no statistical difference between healthy individuals and hemiplegic individuals in terms of age and gender ($p>0.05$), but there was a statistical difference in terms of occupation, marital status and education level ($p<0.05$).

The socio-demographic characteristics of the individuals are shown in Table 1. Among the hemiplegic individuals, 40 (57.1%) could walk independently and 30 (42.9%) used a walking aid for ambulation.

Of the 70 hemiplegic individuals who participated in the study, 22 (31.4%) were normal weight, 24 (34.3%) were overweight, 17 (24.3%) were mildly obese, 5 (7.1%) were moderately obese, and 2 (2.9%) were morbidly obese. In the control group, 28 (40.0%) were normal weight, 21 (30.0%) were overweight, 15 (21.4%) were mildly obese, 3 (4.3%) were moderately obese, and 3 (4.3%) were morbidly obese. Statistically, there was no difference between the two groups ($p>0.05$, Table 2).

It was determined that 39 (55.7%) of hemiplegic individuals gained weight after having a stroke and 31 (44.3%) did not gain weight. Of those who gained weight, 17 (43.5%) gained 0-5 kg, 14 (35.8%) gained 5-10 kg, 7 (17.8%) gained 10-20 kg, and 1 (2.5%) gained 20 kg or more.

Table 1. Comparison of socio-demographic characteristics of the individuals

	Group 1, n=70	Group 2, n=70	t,χ^2	p
Age (years), (X±SD)	61.0±15.4	56.3±11.8	2.015	0.082
Gender, n (%)				
Women	33 (47.1)	36 (51.4)	0.257	0.612
Man	37 (52.9)	34 (48.6)		
Occupation, n (%)				
Working	10 (14.3)	28 (40.0)	11.703	0.001*
Not working	60 (85.7)	42 (60.0)		
Marital status, n (%)				
Married	47 (67.1)	62 (88.6)		
Single	23 (32.9)	8 (11.4)	9.322	0.002*
Education level, n (%)				
Primary	26 (37.1)	10 (14.3)		
Secondary	31 (44.3)	32 (45.7)		
High school	6 (8.6)	6 (8.6)	20.377	0.000*
Undergraduate and above	7 (10.0)	9 (12.9)		
	0 (0.0)	13 (18.6)		

*$p<0.05$, t: t test, χ^2 =chi square test

Table 2. BMI values of the individuals

BKİ value (kg/m^2)	Group 1 n=70 (%)	Group 2 n=70 (%)	χ^2	p
Normal	22 (31.4)	28 (40.0)	1.745	0.475
Overweight	24 (34.3)	21 (30.0)		
Mildly obese	17 (24.3)	15 (21.4)		
Moderately obese	5 (7.1)	3 (4.3)		
Morbid obese	2 (2.9)	3 (4.3)		

$p>0.05$, χ^2 =chi square test, BKİ=Bady mass index

In the statistical analysis, a statistical difference was found between the groups in terms of IPAQ subscales (physical activity level, MET value and level) ($p<0.05$, Table 3). However, no difference was found in terms of sitting time ($p>0.05$, Table 3).

In the statistical analysis performed to determine whether there was a difference between the IPAQ values of normal weight and overweight/obese individuals in hemiplegic patients, a statistical difference was found in terms of MET value, level and sitting time ($p<0.05$, Table 4).

In the statistical analysis performed to evaluate the relationship between BMI and physical activity level, a negative relationship was observed between BMI and physical activity level in healthy and hemiplegic individuals ($p<0.05$, Table 5).

Table 3. Difference in physical activity level between the groups

IPAQ subsscales		Min-Max	X±SS	z	p
Level	Group 1	1.0-2.0	1.4±0.4	-4.8	0.009*
	Group 2	1.0-3.0	1.9±0.5		
MET	Group 1	0.0-1710.0	451.3±417.6	-5.0	0.000*
	Group 2	33.0-9198.0	1399.2±168.9		
Duration of sitting position (dk)	Group 1	120.0-600.0	413.4±144.0	-5.4	0.605
	Group 2	90.0-600.0	271.8±135.3		

*p<0,05, z=Mann-Whitney U test, IPAQ= International Physical Activity Assessment Form

Table 4. Difference in physical activity levels (IPAQ) between overweight/obese (a) and normal weight (b) in hemiplegic individuals

IPAQ subsscales		Min-Max	X±SS	z	p
MET	a, (n=48)	0.0-1350.0	300.9±344.6	-4.5	0,000*
	b, (n=22)	66.0-1710.0	779.3±377.9		
Level	a, (n=48)	1.0-2.0	1.2±0.4	-4.4	0,000*
	b, (n=22)	1.0-2.0	1.8±0.3		
Duration of sitting position (dk)	a, (n=48)	150.0-600.0	460.4±128.5	-4.0	0.000*
	b, (n=22)	120.0-600.0	310.9±123.0		

*p<0,05, z=Mann-Whitney U test, a=overweight/obese, b= Normal, IPAQ= International Physical Activity Assessment Form

Table 5. The relationship between BMI and physical activity level

IPAQ subscale			BMI
Level	Group 1	r	-0.426
		p	0.000*
	Group 2	r	-0.002
		p	0.000*
MET	Group 1	r	0.390
		p	0.001*
	Group 2	r	0.279
		p	0.019*
Duration of sitting position (dk)	Group 1	r	-0.533
		p	0.000*
	Group 2	r	0.006
		p	0.966

r: Spearman correlation, p<0.05, BMI: Body mass index, IPAQ: = International Physical Activity Assessment Form

Discussion

The results of our study showed that stroke patients tended to gain weight in the chronic post-stroke period (after 12 months), had lower physical activity levels compared to healthy individuals, and that body mass index and physical activity level were related.

In the literature, increased body fat or malnutrition after stroke are mentioned. Vahlberg et al. reported that one third of the stroke patients included in the study gained weight within 1 to 3 years after stroke and the rate of obesity increased. The authors stated that most of the individuals participating in the study were mildly hemiparetic and their walking capacity was negatively affected. The researchers emphasized that they did not evaluate the past diet and nutritional history of the individuals in their study and therefore it was difficult to distinguish whether the weight gain and obesity increase was due to excessive calorie consumption or physical inactivity, but they emphasized that affecting the walking capacity of individuals may have been an important factor in the occurrence of sarcopenia and increase in body fat ratio (15).

In some studies, it has been emphasized that low BMI value, excessive weight loss and cachexia are associated with low functional capacity after stroke, and the activities of daily living, clinical and functional capacity of individuals are negatively affected (7,18). In the study by Scherbakov et al., the changes of patients in the 12-month period after stroke were evaluated and it was determined that 63% of the patients remained at a constant weight and/or gained weight, 16% experienced moderate weight loss and 21% became cachexic, and cachexic patients had lower functional and physical capacity values (7).

Although obesity is known to be a risk factor for stroke, excessive weight loss after stroke (especially for normal weight individuals) also significantly increases mortality. For this reason, weight management programs are recommended especially for individuals with weight problems. In the study by Dearborn et al, obese stroke patients were followed up for 2 years and weight change graphs were evaluated. At the end of the study, the researchers observed that only 25% of the individuals lost weight and 19% gained weight at the end of 2 years. The rate of weight gain was evaluated as 5% of the initial weight. The researchers also observed that 5% of the patients with obesity reached the limits of morbid obesity. In the same study, it was found that compared to patients who did not lose weight, patients who lost weight had higher levels of education and those who gained weight were younger (8). In the study by Homer et al. it was observed that hemiplegic patients tended to gain weight in the long term after stroke due to disturbances in eating and activity habits and social isolation. At the end of their study, the authors emphasized that individuals with hemiplegia need advice on controlling diet programs, lifestyle changes and healthy living and that they should definitely be followed up and informed about these issues (9). Weight change in stroke patients after stroke was also observed in the individuals included in our study. It was determined that 55.7% of the individuals included in the study gained weight after stroke, 43.5% of those who gained weight gained up to 5 kg, and the rest gained 5 kg or more. Moreover, 68.6% of the individuals were categorized as overweight and/or obese. Compared to healthy individuals, it was observed that hemiplegic individuals had lower levels of education and more individuals were not employed. These results were consistent with the results of Dearborn et al. It was determined that the individuals who participated in our study were able to perform walking function, 57.1% walked independently and the remaining 42.9% walked with an assistive device. Affected

gait function may significantly affect the level of physical activity. As a matter of fact, in our study, it was found that the amount of energy expended per day and the level of physical activity were lower in hemiplegic individuals compared to healthy individuals, and the sitting time during the day was higher. Difficulties in ambulation and walking function were thought to contribute significantly to weight change rates. When evaluated in this respect, it was interpreted that supporting hemiplegic individuals in physical activity and exercise participation in the post-stroke period and including them in weight management programs would contribute significantly to maintaining a healthy life and function.

In the study by Rist et al. it was emphasized that physical activity level was an important cause of disability in pre- and post-stroke periods when compared with BMI and that individuals should be physically active in order to regain and maintain their independence after stroke (19). The level of physical activity can also significantly decrease the likelihood of re-stroke in individuals who have had a stroke (20,21).

In a study conducted by Paul et al. to determine the physical activity profiles of patients 4.2 years post-stroke, it was observed that patients with hemiplegia took fewer steps, walked at a slower pace and spent more time sedentary during the day compared to healthy controls. It was determined that hemiplegic individuals took 4035 ± 2830 steps during the day and were sedentary for 20.4 ± 2.7 hours (including sleep time), whereas these values were 8394 ± 2941 steps and 17.5 ± 3.8 hours in healthy individuals, respectively (22). Decrease in the number of steps per day and decrease in the activity level of hemiplegic patients after discharge have also been shown in other studies (23-25). In their study, Paul et al. also evaluated the sit-to-stand activity of hemiplegic patients and found that although the mean age of the healthy control group was higher (56.1± 9.5 years for healthy individuals and 55.9±9.9 years for hemiplegics), the healthy control group performed more sit-to-stand activities during the day and were more active than hemiplegic patients (22). The results of our study, as in the studies mentioned above, showed that hemiplegic individuals were more sedentary than healthy individuals. These results can be understood from the fact that the MET value, which is the energy level spent for daily walking and physical activities, is lower and the daily sitting time is higher. Individuals are less active during the day and have lower energy expenditure, despite having the potential to walk (with or without an assistive device). Likewise, the duration of sitting during the day was also higher (413.4±144.0 min (mean 6.8 hours) in hemiplegic individuals and 271.8±135.3 min (mean 4.5 hours) in healthy individuals). An important result obtained from our study is that the number of individuals working in any job is significantly higher in healthy individuals. The occupation performed within the scope of the study was not questioned in detail. However, it was thought that some of the healthy individuals may have done more sitting activities during the day due to work. When evaluated from this aspect, the sedentary life of hemiplegic individuals during the day may be more prominent.

Another important result obtained from our study is that individuals with hemiplegia who have weight problems have much lower physical activity levels compared to normal weight individuals. In the correlation analysis, a negative correlation was observed between BMI and physical activity level and sedentary life. This suggests that high weight and/or obesity significantly limit the physical activity level of hemiplegic patients in the chronic period after stroke. Although it is known that high weight, which is among the modifiable risk factors, is a risk factor for stroke, some studies have emphasized that physical activity level compared with BMI is an important factor in the regulation of blood pressure, weight control and stroke risk after stroke and that activity level should be

maintained (19,26). In addition, since decreased physical activity level and sedentary lifestyle result in weight gain, it was emphasized that the physical activity level of individuals should be increased and plans and programs in this regard should be planned and patients should be ensured to comply. This will be very important in terms of preventing recurrence of stroke and improving the quality of life of individuals. Long-term comparative studies on the level of physical activity before and after stroke in patients with hemiplegia will be helpful in preventing stroke and reducing the risk factors that may develop due to stroke.

Limitations of our study; the diet program and eating habits of the patients were not questioned. Therefore, no clear explanation could be made as to whether weight gain was due to inadequate energy expenditure (e.g., overeating) or excess calorie intake. In future studies, it is recommended that the dietary habits of the patients should also be questioned and the differences before and after stroke should be questioned in more detail. Another limitation of our study is that the physical activity level of the patients before hemiplegia was not questioned in detail. Long-term planning of future studies on this subject will be important in terms of results. It is thought that more studies with detailed evaluations on the subject are needed.

The results of our study showed that patients who developed hemiplegia after stroke had a tendency for physical inactivity and weight gain in the long term after stroke, that negative developments in weight change triggered sedentary life and that patients moved less and the longest activity they performed during the day was sitting activity. It is thought that guiding patients with hemiplegia for appropriate physical activities in the chronic period, ensuring their follow-up and ensuring that they adopt physical activity participation as a lifestyle will be important in terms of maintaining quality of life and general health status. In this study, it was also determined that there is a need for further studies to investigate weight change in the chronic period after stroke and the relationship between this change and physical activity level.

Conflict of interest: There is no conflict of interest between the authors.

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The Impact of Acceptance and Commitment Therapy on Trauma and Psychological Flexibility among University Students Affected by the Earthquake

Ömer YÜNCÜ[1*], Emel Aner AKTAN[2]

[1] İstanbul Nişantaşı University, Postgraduate education Institute, Departmen of Clinical Psychology
[2]İstanbul Nişantaşı University, Faculty of Administrative and Social Sciences, Department of Psychology, İstanbul, Turkey

Abstract

This study aims to examine the impact of Acceptance and Commitment Therapy (ACT) on the trauma levels and psychological flexibility of university students affected by the earthquake. The study included a total of 30 participants. Participants in the research were divided into two groups, an experimental group and a control group, using the stratified random sampling method. In the experimental group, there were 8 males (53.3%) and 7 females (46.7%) aged between 18-30 (M = 23.26; SD = 3.19). Similarly, in the control group, there were 8 males (53.3%) and 7 females (46.7%) aged between 18-30 (M = 23.33; SD = 3.47). The study employed a true experimental design and a 2x2 split-plot the randomized pre-test post-test control group design. The instruments used for data collection were the Post-Earthquake Trauma Level Determination Scale and the Multidimensional Psychological Flexibility Inventory. The experimental group received a 6-week ACT intervention, while no intervention was applied to the control group. In data analysis, paired-sample t-tests, independent samples t-tests, and Pearson correlation analysis were conducted using IBM SPSS 26.0 software. The research found that ACT intervention reduces the impact of earthquake related trauma and enhances psychological flexibility. Additionally, a negative correlation has been observed between earthquake induced trauma and psychological flexibility.

Keyword: *Acceptance and Commitment Therapy, Psychological Flexibility, Posttraumatic Stress Diserder , Acut Stress Disorder, Post-Earthquake Psychology,*

*Corresponding author: Ömer Yüncü E-mail: pskomeryuncu@gmail.com, ORCID ID: 0009-0006-2413-1138

Introduction

Each day, various regions around the world witness the occurrence of diverse disasters or calamities, whether natural or anthropogenic in origin. Natural disasters are defined as rapid, sudden, and extreme events within the geophysical system that surpass the response and recovery capacities of the affected area, leading to harms such as injuries and fatalities among the inhabitants, as well as material damages (1-3). The early detection of potential psychiatric issues in the aftermath of a disaster has been emphasized in the literature as crucial for initiating relief efforts and examining the impacts of the disaster (3). Throughout its history, Turkey has confronted numerous significant earthquakes. The earthquakes that occurred in 1939 and 1999 left deep scars in collective memory due to the substantial loss of life they caused. However, the earthquake on February 6, 2023, surpassed these previous seismic events in both scale of destruction and loss of life, thus securing a distinct place in the national memory. This catastrophe once again highlighted the seismic vulnerability of Turkey, emphasizing the precarious nature of its seismic activity.

The earthquakes that occurred on February 6, 2023, were centered in the Pazarcık and Elbistan districts of Kahramanmaraş province, with magnitudes of Mw 7.7 and Mw 7.6, respectively. Additionally, on February 20, 2023, a seismic event with a magnitude of Mw 6.4 took place in the Yayladağı district of Hatay province. Considering the proximity of Gaziantep province to the epicenters of the earthquakes that occurred on February 6, 2023, and February 20, 2023, it ranks among the severely affected provinces by the seismic events (4).

The psychological effects of earthquakes, which can turn into a devastating disaster, persist for years (5, 6). Exposure to a disaster leads to Posttraumatic Stress Disorder (PTSD) in 30-40% of individuals (7). According to psychological research on disasters, these events have significant impacts on issues related to alcohol and substance use, psychosomatic illnesses, depression, generalized anxiety disorders, PTSD, suicidal thoughts, increased domestic stress and violence, as well as aggression and violence (8-14).

Examining other earthquakes that have occurred, significant natural disasters in Haiti and Japan have left profound marks on the psychological well-being of affected individuals. The traumatic effects that emerge in the aftermath of such disasters, disrupting people's lives, can lead to the development of psychological disorders such as PTSD. The formation of PTSD is associated with the intensity and continuity of challenging experiences endured by individuals who survive disasters (15).

Considering the profound and long-term effects of disasters on human psychology, it is essential to recognize that PTSD is not the sole outcome of trauma, although it is acknowledged as the most commonly encountered psychological disturbance. Studies indicate that the prevalence of PTSD among disaster survivors hovers around approximately 30%, emphasizing that PTSD develops as a direct consequence of exposure to traumatic events. It is underscored that addressing PTSD should not only involve tackling other psychological problems triggered by trauma but also acknowledging that it is not the exclusive result of traumatic experiences. Facilitating the coping mechanisms of individuals affected by disasters and their negative consequences

contributes to fostering positive transformation in these individuals (14).

When examining the literature, studies have demonstrated the long-term psychological effects of disasters. Limited research conducted in Turkey has indicated that the lifetime prevalence of PTSD among individuals after earthquakes is approximately 14.6% (16,17). According to numerous studies, it has been observed that even if the severity of an earthquake is not exceptionally high, its psychological consequences such as PTSD and major depression can have serious and enduring effects, that persisting for years (3, 18-21). The term "trauma" is employed to denote any experience that profoundly disrupts, harms, and injures an individual's psychology and physiological integrity. Stress, on the other hand, refers to any external or internal factor that can disrupt the organism's balance, altering its homeostatic state (22). Trauma is associated with unexpected and sudden events that individuals or those close to them encounter, which may result in death or lead to serious injuries (23-24).

Acceptance and Commitment Therapy (ACT) is a therapy approach that aims to strengthen the psychological flexibility of the individual through the processes of contact with the present moment, acceptance, living by acting in line with their values, and changing their behavior in this direction (25). Psychological flexibility is associated with six processes: contact with the present moment, acceptance, cognitive defusion, self as context, values, and committed action (26). Self-compassion, although not formally integrated as a component of the ACT process model, is being examined by ACT practitioners and researchers to explore its role in psychotherapy (27). Therapeutic approaches that encompass the six processes of ACT and components of self-compassion are reported to be effective in enhancing psychological flexibility in university students (28). Studies have found that ACT increases psychological flexibility in university students and that the effect continues in the long-term (28-35).

ACT emerges as an effective approach in trauma treatment. Individuals diagnosed with PTSD may struggle continuously with traumatic memories, unwanted thoughts, and nightmares. This situation, coupled with avoidance tendencies, emotional difficulties, and efforts to cope with the effects of trauma, can lead the individual to perceive themselves as "damaged" or "broken." The ACT approach focuses on individuals confronting their challenging experiences and accepting them as valuable components of a meaningful life. By directly experiencing and acknowledging distressing memories and emotions, ACT aids individuals in assigning meaning and coherence to the experiences associated with trauma. Professional intervention aims to guide individuals with posttraumatic experiences toward the process of healing (36).

The literature indicates that the use of ACT in the treatment process of individuals with a history of trauma yields positive results in research studies. Therefore, it is considered that ACT is a highly suitable therapeutic approach in the treatment of individuals with a history of trauma (37-42). Furthermore, in a study where ACT was applied to individuals affected by a natural disaster, it was found that individuals' psychological resilience increased (43).

The aim of this research is to examine the impact of ACT on the trauma levels and psychological flexibility of university students affected by an earthquake, with the

objective of assessing the effectiveness of ACT in facilitating individuals' acquisition of trauma resilience and psychological flexibility.

Materials and Methods

The research was designed as an experimental study using a quantitative method to investigate the impact of ACT intervention on the trauma levels and psychological flexibility of university students affected by the earthquake. In this study, the experimental model used was the true experimental research design, and a 2x2 split-plot design was employed. The randomized pre-test post-test control group design has a related design nature due to the dependent variable being measured twice on the same individuals and an unrelated design nature due to the comparison of measurements between different participants in the experimental and control groups (44). This research has been approved by the Ethics Committee of Istanbul Nisantasi University.

In Gaziantep province, a total of 15 experimental and 15 control groups were formed from university students aged 18-30 affected by the earthquake on February 6, 2023, using the stratified random sampling method. Both the experimental and control groups consisted of 8 males and 7 females each. To participate in the research, participants were required to meet the following criteria: not having a psychiatric illness, not undergoing psychiatric treatment or using psychiatric medication, not having a history or thoughts of suicide, not experiencing the destruction of their home or the loss of a first-degree relative in the earthquake, and ensuring that their scores on the Post-Earthquake Trauma Level Determination Scale (PETLDS) were above 52. Score of the PETLDS obtained from the scale were examined using a two stage clustering analysis known as Two-Step Cluster, and individuals' post-earthquake trauma scores were determined. Furthermore, The score obtained from the PETLDS, within the range of 52.385 ± 5.051 points, indicates that an individual assessed with this scale is traumatized. Scores above this threshold indicate high levels of traumatization, while scores below suggest low levels of traumatization (45). The desired score criterion for inclusion in the research was determined with reference to this score. Eight participants who volunteered to participate but did not meet the inclusion criteria were excluded from the study at the beginning of the research.

In this research, the demographic information form, the PETLDS, and the Multidimensional Psychological Flexibility Inventory (MPFI) scales were utilized.

I n this study, the Post-Earthquake Trauma Level Determination Scale (PETLDS), developed by Tanhan and Kayri (45), was utilized to measure participants' trauma levels after the earthquake. A validity and reliability study was conducted for PETLDS. These items are on a 5 point likert scale, rated from the lowest “Strongly Disagree” to the highest “Strongly Agree”. The result of the reliability analysis conducted for the scale showed an internal consistency coefficient Cronbach's alpha of 0.87. The goodness of fit for this model was obtained as follows: RMSEA 0.000, NFI 0.88, GFI 0.94, RMR 0.080, and AGFI 0.92.

In the study, the MPFI, developed by Rolffs and colleagues (46), and adapted into Turkish by Ulubay (47) to suit the Turkish language and culture, was used to measure participants' levels of psychological flexibility. The results of the reliability analysis for the scale are as follows:

Cronbach's alpha coefficient for internal consistency is 0.95, Spearman Brown coefficient for the equivalent halves method is 0.90, Guttman Split-Half coefficient is 0.90, and the test-retest correlation conducted with a 3-week interval is 0.94.

Thirteen weeks after the earthquake, a pre-test was administered to the participants. Following an individual interview with each participant, a total of six online sessions were conducted, once a week. Each session lasted for 60 minutes. Subsequently, a post-test was administered. Throughout this research process, no client has discontinued psychotherapy, and there has been no situation leading to the premature termination of psychotherapy.

The studies conducted in the intervention of ACT have been prepared with the following topics and process: Defining the mind in the ACT approach and explaining the relationships established by the mind; understanding the client's emotions, thoughts, physical sensations, and values with the ACT Matrix, functional analysis, verbal aikido, distinguishing short-term goals from long-term values and relevant metaphors, and exercises; implementation of creative hopelessness; practicing present moment awareness, doing exercises in the here and now; implementation of defusion, exercises for defusion; implementation of acceptance and relevant metaphors, and exercises; implementation of self-compassion and perspective taking; self as context and observing self, self-assessments, differences between mind and self and relevant metaphors, and exercises; recognizing and clarifying values, determining values with exercises; committed action to values and relevant metaphors.

This research was limited to university students in the 18-30 age range who experienced the earthquake in the Gaziantep province. Information about the participants in this study is limited to the questions of the PETLDS and MPFI scales and the Sociodemographic Information Form prepared by the researcher. The data obtained in the research are limited to the values measured by the scales. This study assumes that participants responded sincerely and impartially to the measurement tools.

For data analysis, IBM SPSS 26.0 software was utilized. Matched pairs t-test was employed to compare the psychological flexibility dimensions and post-earthquake traumatic stress scores of participants in the experimental and control groups. Additionally, independent samples t-test was conducted to compare the psychological flexibility and post-earthquake traumatic stress scores between the experimental and control groups. Furthermore, Pearson Correlation was applied to examine the relationship between the psychological flexibility and post-earthquake traumatic stress scores of the experimental and control groups. When deciding which tests to apply in the study, skewness and kurtosis values of the sub-dimensions and total scores for both the experimental and control groups were checked. Since skewness and kurtosis values were between -3 and +3, it was assumed that the data had a normal distribution (48). Therefore, parametric measurements were deemed appropriate.

Results

The paired-sample t-test results for examining the differences in post-earthquake traumatic stress and psychological flexibility scores of the experimental group are presented in Table 1.

Tablo 1. Matched Sample T-Test Results for the Pre-Measurement and Post-Measurement Score Differences of the Experimental Group

		Matched Differences					
		$\bar{x}$	Ss	SH_M	t	sd	p
Pair 1	PETLDS Pre-Measurement - PETLDS Post-Measurement	31.733	9.262	2.391	13.270	14	<.000***
Pair 2	MPFI Pre-Measurement - MPFI Post-Measurement	-129.267	10.082	2.603	-49.660	14	<.000***
Pair 3	Acceptance Pre-Measurement - Acceptance Post-Measurement	-14.667	2.690	.695	-21.114	14	<.000***
Pair 4	Present Moment Pre-Measurement - Present Moment Post-Measurement	-24.667	2.845	.735	-33.577	14	<.000***
Pair 5	Self as Context Pre-Measurement - Self as Context Post-Measurement	-20.733	2.463	.636	-32.602	14	<.000***
Pair 6	Defusion Pre-Measurement - Defusion Post-Measurement	-25.800	4.144	1.070	-24.114	14	<.000***
Pair 7	Values Pre-Measurement - Values Post-Measurement	-20.867	3.182	.822	-25.400	14	<.000***
Pair 8	Committed Action Pre-Measurement - Committed Action Post-Measurement	-22.533	4.357	1.125	-20.031	14	<.000***

In the experiment group, Traumatic stress levels was significantly lower in the post-measurement compared to the pre-measurement (t=13.270; p<.001). Psychological flexibility post-measurement scores were found to be significantly higher than pre-measurement scores (t=-48.660; p<.001). It was also found that all sub-dimensions of psychological flexibility (acceptance, present moment, self as context, defusion, values, committed action) had significantly higher post-measurement scores compared to pre-measurement scores (respectively t=-21.114; p<.001, t=-33.577; p<.001, t=-32.602; p<.001, t=-24.114; p<.001, t=-25.400; p<.001, t=-20.031; p<.001). When the differences between the pre-measurement and post-measurement scores of the control and experimental groups are compared, it is observed that the score difference in the experimental group is higher than that of the control group.

Table 2. Pearson Correlation Findings for the Examination of the Relationship Between the Post-Measurement Scores of the Experimental Group

		PETLDS Post-Measurement
MPFI Post-Measurement	r	-.516*
	p	.049
	N	15

According to the Pearson Correlation findings in Table 2, the relationship between the post-measurement scores of the experimental group indicates a significant negative correlation between post-earthquake trauma levels and psychological flexibility total score (r=-.52; p<0.01).

Table 3. Independent Samples T-Test for the Comparison of Post-Measurement Scores between Experimental and Control Groups

	groups	N	x̄	Ss	t	p
PETLDS Post-Measurement	experimental	15	37.53	3.925	-7.792	<.001***
	control	15	58.27	9.528		
MPFI Post-Measurement	experimental	15	269.13	13.731	22.645	<.001***
	control	15	159.40	12.794		
Acceptance Post-Measurement	experimental	15	28.33	1.447	21.239	<.001***
	control	15	15.47	1.846		
Present Moment Post-Measurement	experimental	15	49.53	3.758	15.610	<.001***
	control	15	29.40	3.291		
Self as Context Post-Measurement	experimental	15	41.73	3.240	15.261	<.001***
	control	15	23.53	3.292		
Defusion Post-Measurement	experimental	15	49.00	3.566	13.161	<.001***
	control	15	27.13	5.357		
Values Post-Measurement	experimental	15	50.27	3.826	11.684	<.001***
	control	15	32.80	4.346		
Committed Action Post-Measurement	experimental	15	50.27	3.327	14.128	<.001***
	control	15	31.07	4.079		

According to the independent samples t-test results comparing the total and sub-dimension scores of psychological flexibility, and the post-earthquake trauma level post-measurement scores between the experimental and control groups in Table 3, the post-earthquake trauma level ($t=-7.79$; $p<0.001$) was found to be significantly higher in the control group. Additionally, the psychological flexibility post-measurement total score ($t=22.64$; $p<0.001$) and all subdimension (acceptance, present moment, self as context, defusion, values, committed action) scores (respectively $t=21.24$; $p<0.001$, $t=15.61$; $p<0.001$, $t=15.26$; $p<0.001$, $t=13.16$; $p<0.001$, $t=11.68$; $p<0.001$, $t=14.12$; $p<0.001$) were significantly higher in the experimental group. According to the findings, acceptance and commitment therapy applied to the experimental group had an impact on increasing psychological flexibility scores and decreasing post-earthquake trauma levels.

Discussion

According to the findings of the study, in the post-measurement, the trauma level of the experimental group, which received ACT, is lower than that of the control group. Additionally, the amount of reduction in trauma level exhibited by the experimental group is greater than the reduction observed in the trauma level of the control group.

It is observed that in the post-measurement, the psychological flexibility level of the experimental group, which received ACT, is higher than that of the control group. Additionally, the increase in psychological flexibility shown by the experimental group is greater than the increase observed in the psychological flexibility of the control group. Moreover, the applied ACT to the experimental group has influenced both the increase in the total score of psychological flexibility and the increase in the scores of the 6 subdimensions of psychological flexibility. Futhermore, it is observed that both the control and experimental groups have experienced a reduction in their traumas at the end of this 6-week process. However, while there is a smaller decrease in the control group, there is a larger decrease in the trauma level of the experimental group. Similarly, although psychological flexibility increases in both groups, there is a greater increase in the experimental group. These findings suggest that the passage of time may have a small impact on reducing trauma, albeit not as significant as ACT. Additionally, it is noteworthy that during this period of reduced trauma, there is an increase in psychological flexibility. In the experimental group, a negative correlation between trauma and psychological flexibility was found in the final test.

The findings regarding the increase in psychological flexibility and the reduction of trauma levels through ACT obtained from the study are consistent with other research in the literature we cannot for see the sustainability of these results from this research alone. (28-35, 37-42, 49). Although pre-tests and post-tests were conducted in the study, no follow up test was administered after the termination of therapy to assess whether there were any changes in individuals' conditions. Future research could gain insights into the sustainability of ACT's effectiveness by implementing follow up tests after some time has passed since therapy termination. In this context, in a study conducted by Yapan, Murat and Yavuz, findings were obtained from follow up measures conducted one month and three months

after the application of an ACT based psychoeducation program (50). The results indicated a decrease in test anxiety and an increase in cognitive defusion and acceptance in individuals after ACT intervention. This improvement persisted in the period following the completion of the ACT intervention. This outcome suggests that the impact of ACT intervention may endure in the postintervention period.

In a study, participants stated that they enjoyed the ACT process. Additionally, unlike CBT, participants did not terminate therapy prematurely in the ACT process. Researchers have mentioned that individuals are more likely to stick to a therapy they enjoy (51). Consistent with the mentioned study, in this research, no participant in the ACT process terminated therapy early, and the process was completed with all participants as planned.

In a study conducted by Larsson, Hartley and McHugh, a web based self help intervention covering the aspects of contact with the present moment, cognitive defusion, and self as context was applied to university students without psychiatric diagnoses, with a 3-week follow up (30). Although this intervention was found to have beneficial effects on individuals' psychological well-being, it was observed that it did not have a significant impact on depression, anxiety, and stress symptoms compared to the control group. Researchers attributed this situation to the intervention program not covering all processes. Considering the findings of their study, which did not cover all processes, and the findings of this study, which took care to cover all processes, comparisons can be made in future studies between self help programs covering all processes and therapist led ACT interventions. This way, the effectiveness of self help programs at various points can be addressed. Additionally, compared to ACT application, areas where ACT application may fall short can be identified, and the feasibility of implementing a self help program for exercises after ACT sessions can be explored.

The participants included in the study were individuals who did not experience the loss of first-degree family members and whose homes were not destroyed due to the earthquake. Although the participants consisted of individuals who were significantly affected by the earthquake (having experienced the loss of acquaintances who were not first-degree family members, being forced to leave home, witnessing the destruction of other people's homes, etc.), there is a possibility that they may not have been as traumatized as individuals whose homes were destroyed and had first-degree family losses. The importance of this information about the participants lies in the fact that the earthquake related destruction and damage experienced by individuals affected by the earthquake are directly proportional to PTSD and depressive symptoms (10). On the other hand, based on the findings obtained from the PETLDS used in this study, we know that all participants were individuals with high levels of post-earthquake trauma. The fact that the participants had experienced the earthquake and were traumatized is one of the aspects that makes this study strong. In addition to this situation, in the study, the trauma levels of the control group were lower, and conversely, their psychological flexibility was higher in the pre-measurements compared to the experimental group. However, according to both the post-earthquake trauma levels and psychological flexibility results, both groups consisted of

individuals with high trauma levels and low psychological flexibility. The sample selection in the study was made through a random stratified sampling method, and this difference between the two groups did not pose a problem in the study since it was not significant.

The researcher observed that participants had difficulty coping with earthquake-related stress factors in the post-earthquake period rather than during the earthquake itself during the ACT application process. Participants expressed a preference for focusing on the post-earthquake experiences rather than delving into matters pertaining to the moment of the earthquake. Furthermore, their lived fusion-like experiences were largely unrelated to the earthquake moment but instead centered around the challenges they faced and the struggles they endured in the aftermath of the earthquake. Perhaps the fact that participants were not individuals stranded beneath the earthquake-ravaged house may have contributed to this situation. However, in this study, it was still observed that post-earthquake problems caused by the earthquake had a more significant impact on individuals than the impact of the earthquake itself.

Individuals having pre-existing symptoms related to psychological issues before the earthquake may have fewer resources to cope with the difficulties arising after the earthquake (10). This situation could lead to the inclusion of another external variable in the research. Due to the unpredictability of the earthquake, participants were not assessed for pre-earthquake symptoms. However, the inclusion criteria for participants, such as the absence of a psychiatric diagnosis, no history or thoughts of suicide, and not using psychiatric medication, helped control this to some extent.

In this study, regular conversations were held with the experimental group during the ACT intervention process, while no such conversations took place with the control group. The possibility that simply having conversations may have made a difference in the experimental group compared to the control group is conceivable. Pennebaker suggests that talking with people can have positive effects on their health, focusing more on physical health measures than primary outcome criteria for psychological health (52). According to Nolen-Hoeksema and Morrow, talking about the earthquake with someone (such as friends) alone has neither benefits nor harms (10). Researchers stated that people tend to talk about the earthquake continuously after it happened, are eager to talk, and therefore, individuals do not have difficulty finding someone to talk to about it. In this context, the lack of a noticeable effect of conversation alone and the opportunity for the control group to find someone to talk to about it indicate that this situation is not a problem for the study. However, in future research, a control group could be established where individuals talk about the earthquake in a social environment but without including a therapy like intervention.

Our findigs from this research provided us with further insight into the impact of ACT on the trauma levels and psychological flexibility of individuals affected by the earthquake, allowing us to anticipate the applicability of this therapy to other trauma situations. These anticipations may open new avenues for studies in this field. Our research results gave us new insight about the development of effective treatment methods for reducing trauma levels and

increasing psychological flexibility in individuals affected by earthquakes. Additionally, there is limited research on the use of ACT with individuals affected by earthquakes in the literature. With this study we took a step towards addressing this research gap and guiding future studies.

The effectiveness of ACT in the treatment of trauma-related psychological disorders, such as PTSD, was assessed. Additionally, the psychological flexibility levels of individuals with these conditions were evaluated. The results obtained from this research may contribute to the broader dissemination of this method. Furthermore, this research may pioneer studies on how ACT can be more effectively applied to individuals who have experienced earthquake trauma, exploring which stages of therapy are more beneficial for individuals.

Conclusion

This research demonstrates that ACT intervention reduces the trauma levels of university students affected by the earthquake and increases their level of psychological flexibility. Therefore, the use of ACT in working with earthquake trauma has been suggested. Additionally, this study shows that ACT enhances psychological flexibility and that psychological flexibility is effective in coping with trauma. In light of all these findings, it can be predicted that when psychological flexibility increases, trauma levels decrease, and ACT positively affects trauma survivors by enhancing psychological flexibility. In this context, it is assumed that this research will make valuable contributions to both therapeutic practice and individuals in need of posttraumatic psychological support.

Conflict of Interests

The authors declare that there are no actual or potential conflicts of interest. They affirm their independence from any sponsors, emphasizing that the content of the article has not been influenced by any sponsorship.

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