Mehmet Akif Ersoy Üniversitesi

Sağlık Bilimleri Enstitüsü Dergisi

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Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi yılda 3 sayı olarak yayımlanır (Aralık-2019 itibariyle). Dergi, *DOAJ, Google Scholar, SciLib, Researchbib, SOBIAD, Türkiye Atıf Dizini* gibi ulusal ve uluslararası indeksler tarafından taranmaktadır.

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Yayın Kurulu / Advisory Board

I- Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi Genel Bilgiler

Mehmet Akif Ersoy Üniversitesi (MAKÜ) Sağlık Bilimleri Enstitüsü Dergisi, Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü'nün yayın organıdır. Derginin kısaltılmış adı "MAKÜ Sag. Bil. Enst. Derg" dir. Yılda 2 kez yayınlanır. MAKÜ Sağlık Bilimleri Enstitüsü Dergisi sağlık bilimleri, (veteriner, tıp, diş hekimliği, hemşirelik ve spor bilimleri) alanlarında temel ve klinik hakemli bilim yazılarının yayınlandığı hakem-denetimli bir dergidir. Derginin dili İngilizce'dir. Dergiye gönderilen yazıların başka herhangi bir dergide yayınlanmamış, yayına kabul edilmemiş ya da yayınlanmak üzere değerlendirme aşamasında olmaması gerekir. Bu kural bilimsel toplantılarda sunulan ve özeti yayınlanan bildiriler için geçerli değildir. Ancak, bu gibi durumlarda bildirinin sunulduğu toplantının adı, tarihi ve yeri bildirilmelidir. Makalelerin formatı "Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication (http:/www.icmje.org/)" kurallarına göre düzenlenmelidir.

Gönderilen yazılar yayın kuruluna ulaştıktan sonra öncelikle, yazım kurallarına uygunluğu yönünden değerlendirilir; sonucu yazara dört hafta içinde bildirilir. Yazının, gerek teknik özellikleri gerekse genel kapsamı açısından derginin genel yayın ilkelerine uygun bulunmaması durumunda yazı reddedilir. Ya da, gerekirse, yazar(lar)ın yazıyı yazım kurallarına uygun biçimde yeniden göndermeleri istenebilir. Yeniden gönderilen yazılar benzer bir teknik incelemenin ardından yazım kurallarına uygun ise danışman denetimi sürecine alınır. Yazı, editör ve yardımcı editörler ile yazının başlık sayfasını görmeyen en az iki danışmana gönderilerek incelenir. Yazı, yayın kurulunun belirlediği ve bilimsel içerik ve yazım kuralları açısından değerlendirilir. Editör ve yardımcı editörler gerek gördüğünde makaleyi üçüncü bir danışmana gönderebilir. Hakem belirleme yetkisi tamamen editör ve yardımcı editörler ve yayın kuruluna aittir. Danışmanlar belirlenirken derginin uluslararası yayın danışma kurulundan isimler seçilebileceği gibi yazının konusuna göre ihtiyaç duyulduğunda yurt içinden veya yurt dışından bağımsız danışmanlar da belirlenebilir. Daha sonra, danışman raporları dikkate alınarak ve gerekirse yazar(lar)la tekrar iletişim kurularak yayın kurulunca son redaksiyon yapılır. Yazıların kabulüne editör karar verir.

Editör yayın koşullarına uymayan yazıları; düzeltmek üzere yazarına geri gönderme, biçimce düzenleme veya reddetme yetkisine sahiptir. Yazılarını geri çekmek isteyen yazarlar bunu yazılı olarak editöre bildirmek durumundadır. Editör görülen lüzum halinde bazı makaleler hakkında yayın yürütme kurulunun görüşüne başvurur. Bu değerlendirme süreci dergiye gönderilen yazı türlerinden araştırma yazılarını, olgu sunumlarını ve özgün yazıları kapsar. Diğer yazı türlerindeki yazılar doğrudan yayın kurulunca değerlendirilir. Dergiye gönderilen yazılar yayınlansın ya da yayınlanmasın geri gönderilmez. Tüm yazarlar bilimsel katkı ve sorumluluklarını ve çıkar çatışması olmadığını bildiren toplu imza ile yayına katılmalıdır. Araştırmalara yapılan kısmi de olsa nakdi ya da ayni yardımların hangi kurum, kuruluş, ilaç-gereç firmalarınca yapıldığı dip not olarak bildirilmelidir. Dergide yayınlanan yazılar için herhangi bir ücret ya da karşılık ödenmez.

Yayın kurulu yazar(lar)ın dergiye gönderdikleri yazıları değerlendirme süreci tamamlanmadan başka bir dergiye göndermeyeceklerini taahhüt ettiklerini kabul eder. İnsanlar ve hayvanlar üzerinde yapılan deneysel araştırmaların bildirildiği yazıların gereç ve yöntem bölümünde, bu araştırmanın yapıldığı gönüllü ya da hastalara uygulanan işlemler anlatıldıktan sonra kendilerinin onaylarının alındığını (informed consent) gösterir bir cümle bulunmalıdır. Yazar(lar), bu tür araştırmalarda, uluslararası alanda kabul edilen kılavuzlara (2002 yılında revize edilen 1975 Helsinki Deklarasyonu- http://www.wma.net/e/policy/b3.htm, Guide for the care and use of laboratory animals - www.nap.edu/catalog/5140.html), T.C. Sağlık Bakanlığı tarafından getirilen, 29 Ocak 1993 tarih ve 21480 sayılı Resmi gazetede yayınlanan "İlaç Araştırmaları Hakkında Yönetmelik" ve daha sonra yayınlanan diğer yönetmeliklerde belirtilen hükümlere uyulduğunu belirtmeli ve kurumdan aldıkları Etik Kurul Onayı'nın bir kopyasını göndermelidir. Metin içinde standart kısaltmalar kullanılır, bunlar ilk geçtikleri yerde açık olarak yazılır. İlaç adları kullanımında ilaçların jenerik adları Türkçe okunuşlarıyla yazılır. Ölçüm birimleri metrik sisteme uygun olarak verilir; örneğin, "mg" olarak yazılır, nokta kullanılmaz; ek alırsa („) ile ayrılır. Laboratuar ölçümleri Uluslararası Sistem (US; Systéme International: SI) birimleri ile bildirilir.

Bilimsel sorumluluk

Makalelerin tüm bilimsel sorumluluğu yazarlara aittir. Gönderilen makalede belirtilen yazarların çalışmaya belirli bir oranda katkısının olması gereklidir. Yazarların isim sıralaması ortak verilen bir karar olmalıdır. Sorumlu yazar, yazar sıralamasını "Yazar Sorumluluk ve Yayım Hakkı Devir Formu'nu" doldurarak tüm yazarlar adına kabul etmiş sayılır. Yazarların tümünün ismi makale başlığının altındaki bölümde yer almalıdır.

Yayın Ücretleri

Bu dergide yayın tamamen ücretsizdir. Yayın ücreti, başvuru ücreti, makale işleme ücreti ve bir figürün, rakamın veya tamamlayıcı verinin uzunluğuna göre ek ücret ödenmesi gerekmez. İçerik öğeleri (Editörler, Düzeltmeler, İlaveler, Geri Çekmeler, Mektuplar, Yorumlar vb.) tamamen ücretsizdir.

Etik sorumluluk

Makalelerin etik kurallara uygunluğu yazarların sorumluluğundadır. Hayvanlar üzerinde yapılan deneysel çalışmalarda, çalışma protokolünün çalışmanın yapıldığı kurumdaki hayvan deneyleri etik kurulu tarafından onaylandığı belirtilmelidir. Yazarlar etik kurul onayını makale ile birlikte göndermelidir. Eğer makalede daha önce yayımlanmış alıntı yazı, tablo, resim vs. var ise yazarlar; yayım hakkı sahibi ve yazarlarından yazılı izin alarak bu durumu makalede belirtmek zorundadır. Makalenin değerlendirilmesi aşamasında yayın kurulunun gerek görmesi halinde, makale ile ilgili araştırma verilerinin ve/veya etik kurul onayı belgesinin sunulması yazarlardan talep edilebilir.

İntihal politikası

Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi'ne (MAKÜ Sag. Bil. Enst. Derg.) Gönderilen yazılar intihal açısından değerlendirilir. Her gönderilen makale, iThenticate ve Turnitin yazılımı ile intihal için kontrol edilir. Makalenin benzerlik oranı %20'nin üzerinde ise, revize edilmesi için ilgili yazara geri gönderilir. Eğer makalenin yayınlanmasından sonra intihal kanıtlanırsa, bu makale derhal web sitesinden kaldırılır ve ilgili yazarlara makalelerinin MAKÜ Sag. Bil. Enst. Derg.'de yayınlanmasının uygun olmadığı bildirilecektir.

II- Dergiye Gönderilecek Yazı Türleri ve Özellikleri

a) Araştırma Makaleleri: Bu yazılar daha önce yayınlanmamış özgün araştırma verilerinin değerlendirildiği net anlam taşıyan bilimsel çalışmaları kapsar. Araştırma makaleleri "Öz, Giriş, Gereç ve Yöntem, Bulgular, Tartışma ve Kaynaklar" bölümlerinden oluşmalıdır. Dergide yayınlanmak üzere gönderilen araştırma makaleleri kapak sayfası hariç en fazla 20 sayfa olmalıdır. Araştırma makalelerinde kullanılacak tablo, çizim ve resim sayısı toplam 10'u geçmemelidir. Yazarlar gerek duydukları takdirde "Tartışma" bölümünden sonra "Teşekkür" bölümü açarak gerekli açıklamaları yapabilirler.

b) Derleme Makaleleri: Derleme makaleleri dergi editör/yayın kurulu tarafından "çağrılı derlemeler" başlığı altında oluşturulan alnında katkı sağlama potansiyeli olan yazıları içerir. Kaynakça bölümü en fazla 30 kaynakçadan oluşturulmalıdır. Derlemelerde kullanılacak tablo, çizim ve resim sayısı toplam 10'u geçmemelidir. Kapak sayfası hariç en fazla 20 sayfa olarak hazırlanmalıdır. Derlemelerde mutlaka "Öz, Giriş, Sonuç ve Kaynaklar" bölümleri bulunmalıdır.

c) Olgu Sunumları: Yazarların, herhangi planlanmış bir araştırmaya dayanmayan ancak karşılaştıkları yeni veya ender gözlemlenen olguların ele alındığı, bilimsel değere sahip bilgileri içeren eserlerdir. Bu eserlerde gereksiz uzatmaları önlemek amacıyla en fazla 15 kaynak kullanılmalı ve bu kaynakların güncel olmasına özen gösterilmelidir. Kapak sayfası hariç en fazla 5 sayfa olmalı; "Öz, Giriş, Olgu, Tartışma ve Kaynaklar" bölümlerinden oluşmalıdır.

d) Kısa Araştırma Raporu: Dar kapsamlı ele alınmış (sınırlı sayıda örneğin analiz edildiği çalışmalar vb.) ancak önemli ve yeni bilgiler sunan bilimsel araştırmaya dayalı makalelerdir. Kısa bildiriler araştırma makalesi formatında hazırlanmalı ve kapak sayfası hariç en fazla 10 sayfa olmalıdır. Bu eserlerde kullanılacak tablo ve şekil sayısı beşi geçmemelidir.

e) Özel Bölümler:

1. Editöre mektuplar: Dergide yayınlanan yazılara ilişkin değerlendirme ve eleştirileri içeren yazılardır. Mümkün olduğunca eleştirilen yazının yazar(lar)ınca verilen yanıtlar ile birlikte yayınlanır. Editöre mektuplar 3 sayfayı geçemez.

2. Toplantı haberleri/izlenimleri: Derginin yayın alanıyla ilgili konularda yapılmış ya da yapılacak olan bilimsel toplantıları tanıtıcı yazılardır. 1 sayfayı geçemez.

3. Dergi haberleri: Derginin yayın alanıyla ilgili konularda yayınlanmakta olan bilimsel dergileri tanıtıcı yazılardır; 1 sayfayı geçemez.

4. Web siteleri tanıtımı: Derginin yayın alanıyla ilgili konulardaki web sitelerini tanıtıcı yazılardır; 1 sayfayı geçemez.

5. Kitap/tez tanıtımı: Derginin yayın alanıyla ilgili konularda yayınlanmış bulunan kitapları/tezleri tanıtan yazılardır; 3 sayfayı geçemez.

III- Makalelerin Düzenlenmesi

Dergiye gönderilecek yazılar türlerine göre, başlık sayfası, İngilizce ve Türkçe özetler, ana metin, kaynaklar, tablo/şekil/resim bölümlerini içerir. Dergiye yayınlanması için gönderilen makalelerde aşağıdaki biçimsel esaslara uyulmalıdır: Yazı Microsoft Word programında Times New Roman yazı stilinde 12 punto büyüklüğünde, siyah renkte, 1,5 satır aralığında hazırlanmalıdır. Kenarlardan 2,5 cm boşluk bırakılmalıdır. Her sayfaya satır numarası eklenmelidir.

Anatomik terimler Latincede yazıldığı gibi kullanılmalıdır. Günlük tıp diline yerleşmiş terimler ise okundukları gibi Türkçe yazım kurallarına uygun olarak yazılmalıdır. İngilizce veya başka bir yabancı dildeki şekli ile yazılan terimler tırnak içinde belirtilmelidir. Yazının başlık sayfasında, yazının Türkçe ve İngilizce başlığı ve sayfa üstünde kullanılmak üzere boşluklar da dahil 40 karakteri aşmayacak şekilde Türkçe ve İngilizce kısa başlık önerisi bulunmalı. Çalışmaların yapıldığı klinik, anabilim dalı/bilim dalı, enstitü ve kuruluşun adı belirtilmelidir.

a) Başlık Sayfası: Gönderilen makalenin kategorisini, başlığını (Türkçe-İngilizce ve sadece ilk sözcüğün baş harfi büyük), yazarların adlarını (sadece baş harfleri büyük yazılır), çalıştıkları kurumları (rakamla dipnot olarak belirtilmeli), yazışmaların yapılacağı sorumlu yazarın adı, açık adresi, telefon ve faks numaraları ile e-posta adresini içermelidir. Sorumlu yazar yıldız (*) ile belirtilir. Makale daha önce bilimsel bir toplantıda sunulmuş ise toplantının adı, tarihi ve yeri belirtilerek yazılmalıdır.

b) Ana Metin Bölümü: Yazının ana metni Öz ve Anahtar Kelimeler, Giriş, Gereç ve Yöntem, Bulgular ve Tartışma başlıkları içinde düzenlenir. Özler ve anahtar sözcükler: Türkçe ve İngilizce olmak üzere iki dilde yazılır ve yazının başlığını da içerir.

Öz 200 kelimeyi geçmemeli, çalışmanın ana noktaları olan amacını, hayvan ve örnek popülasyonunu, metodunu ve önemli sonuçlarını, çalışmadan elde edilen çıkarımı klinik olarak uygulanabilirliğini içermelidir. Yayını okumadan okuyucular için anlaşılır olmalıdır ve özet içinde kaynaklara atıf yapılmamalıdır. Türkçe ve İngilizce özetler ayrı sayfalarda yazılmalı ve özetlerin sonunda her iki dilden en az 3, en çok 5 anahtar sözcük yer almalıdır. Anahtar kelimeler Index Medicus Medical Subject Headings (MeSH)'e uygun olmalıdır. Anahtar kelimeler için www.nlm.nih.gov/mesh/MBrowser.html adresine başvurulmalıdır.

Giriş bölümünde yazının dayandığı temel bilgilere ve gerekçelere kısaca değinildikten sonra, son paragrafında amaç açık bir anlatımla yer alır. Gereç ve yöntem bölümü gerekirse araştırma/hasta/denek grubu, araçlar, uygulama ve istatistik değerlendirme gibi alt başlıklara göre düzenlenebilir. Bu bölüm çalışmaya katılmayan birisinin de rahatlıkla anlayabileceği açıklıkta yazılmalıdır. Bulgular bölümü çalışmanın sonuçlarını özetler ve temel bulgular gerekirse tablo ve şekillerle desteklenir. Tartışma bölümünde çalışmanın bulguları ilgili yurt içi ve yurt dışı çalışmaların sonuçları bağlamında tartışılır; genel bir gözden geçirmeyi değil, özgün bulguların tartışılmasını içerir. Yayın sisteme yüklenirken ana metin bölümü ana dosya olarak yüklenmelidir.

c) Teşekkür: Yazarlar çalışmalarında vermek istedikleri ek bilgiler ile katkı sağlayan destekçi kurumlara ve/veya şahıslara teşekkür yazılarını bu bölümde belirtebilirler.

d) Kaynaklar: Kaynaklar listesi alfabetik sıraya göre yazılmalıdır. Sadece yayınlanmış veya yayına kabul edilmiş kaynaklar yer almalıdır. Kabul edilmiş ancak henüz yayınlanmamış kaynaklar için "baskıda" ifadesi kullanılmalıdır. Yazarlar kaynaklar listesinde bulunan bütün kaynakların metin içinde kullanılmış olduğunu kontrol etmelidirler.

Yayındaki bütün kaynaklar kullanılmalıdır. Makale içinde referans kullanma şekline örnekler.

Metin içinde doğrudan atıf yapılırken yazar veya yazarların soyadından sonra parantez içinde kaynağın yayın yılı belirtilmelidir.

Örnekler: Bell (2005) tarafından; Nielsen ve Engberg (2006) tarafından; Doyle ve ark. (2007) tarafından

Cümlenin sonunda atıf yapıldığında ise yazar ismi ve yayın yılı parantez içinde belirtilmelidir.

Örnekler: ...bildirilmiştir (Bell, 2005); ....bildirilmiştir (Nielsen ve Engberg, 2006); .....bildirilmiştir (Doyle ve ark., 2007).

Birden çok kaynağa atıf yapılması durumunda kronolojik sıralama yapılmalıdır.

Örnekler: ….bildirilmiştir (Bell, 2005; Nielsen ve Engberg, 2006; Doyle ve ark., 2007).

Aynı yazarın aynı yıl yayınları söz konusu ise her biri "a" harfinden başlayarak küçük harflerle işaretlenmelidir.

Örnek: …. (Bell, 2005a; Bell, 2005b; Bell, 2005c …). Atıf yapılırken aşırı kaynak kullanımından kaçınılmalıdır.

Kaynaklar listesinin düzenlenmesi:

Mendeley programı kullanan yazarlar aşağıda linki verilen dergi format stilini kullanarak çalışmalarını düzenleyebilir:
https://csl.mendeley.com/styles/529990351/makusagbilensderg

Kaynaklar listesinde yazar isimleri ve yayın yılı koyu harflerle yazılmalıdır. Kaynak listesi şu şekilde hazırlanmalıdır:

i) Kaynak makale ise

Yazarların soyadları ve adlarının ilk harfi yazılmalıdır. Devamında sırasıyla makalenin yayın yılı, makalenin adı, yayınlandığı derginin açık adı, cilt, sayı ve sayfa numaraları belirtilmelidir.

Örnekler:

Cohen, N.D., Vontur, C.A., Rakestraw, P.C., 2000. Risk factors for enterolithiasis among horses in Texas. Journal of the American Veterinary Medical Association 216, 1787-1794.

Rajmohan, S., Dodd, C.E., Waites, W.M., 2002. Enzymes from isolates of *Pseudomonas fluorescens* involved in food spoilage. Journal of Applied Microbiology 93, 205-213.

Ono, K., Yamamoto, K., 1999. Contamination of meat with *Campylobacter jejuni* in Saitama, Japan. International Journal of Food Microbiology 47, 211-219.

Yayınlanmak üzere kabul edilen ve DOI numarası bulunan, ancak henüz basılmamış makaleler için; makale künyesinin sonunda DOI numarası belirtilmelidir.

McGregor, B.A., Butler, K.L., 2014. The value of visual fleece assessment in addition to objective measurements in identifying Angora goats of greater clean mohair production. Small Ruminant Research, in press (DOI: 10.1016/j.smallrumres.2014.04.001).

ii) Kaynak kitap ise

Yazarların (veya editörün) soyadları ve adlarının ilk harfi yazılmalıdır. Devamında sırasıyla kitabın yayın yılı, adı, yayınevi veya yayınlayan kuruluş ve yayınlandığı yer belirtilmelidir. Kaynak, kitaptan bir bölüm ise bölüm yazarlarının isminden sonra sırasıyla kitabın yayın yılı, bölümün adı, editörün soy ismi ve adının ilk harfi, bölümün alındığı kitabın adı, yayınevi veya kuruluş, yayınlandığı yer, bölümün sayfa numaraları yazılmalıdır.

Örnekler:

Combs, G.F., 1992. The Vitamins: Fundamental Aspects in Nutrition and Health. Academic Press, San Diego.

Concannon, P.W., 1986. Physiology and Endocrinology of Cannine Pregnancy. In: Marrow, D.A. (Ed.), Current Therapy in Theriogenology. Philadelphia, W.B. Saunders Company, pp. 491-497.

Perkins, J.B., Pero, J., 2002. Vitamin biosynthesis. In: Sonenshein, A., Hoch, J., Losick, R. (Eds.), Bacillus subtilis and Its Closest Relatives: from Genes to Cells. ASM Press, Washington D.C., pp. 271-286.

Kramer, J.M., Gilbert, R.J., 1989. Bacillus cereus. In: Doyle, M.P. (Ed.), Foodborne Bacterial Pathogens. Marcel Dekker, New York, pp. 22-70.

iii) Kaynak bir tez ise

Tezi yazan kişinin soyadı ve adının ilk harfi koyu olarak yazılmalı, kabul edildiği yıl, tezin başlığı, tezin cinsi (yüksek lisans veya doktora), üniversitesi ve enstitüsü belirtilmelidir.

Örnek:

Bacınoğlu, S., 2002. Boğa spermasında farklı eritme süreleri ve eritme sonrasında oluşturulan soğuk şoklarının spermatolojik özelliklere etkisi. Doktora Tezi, İstanbul Üniversitesi Sağlık Bilimleri Enstitüsü, İstanbul.

iv) Kaynak internette bulunan bir web sitesi ise

Yazarların soyadları ve adının ilk harfi (Yazar adı yoksa web sitesinin veya kaynağın adı) yazılır. Daha sonra sırasıyla yılı, makalenin adı, varsa yayıncı, internet adresi ve erişim tarihi belirtilir.

Örnekler:

FDA, 2001. Effect of the use of antimicrobials in food-producing animals on pathogen load. Systematic review of the published literature. http://www.fda.gov/cvm/antimicrobial/PathRpt.pdf (Erişim 14.12.2001)

Cleveland, C.W., Peterson, D.S., Latimer, K.S., 2005. An Overview of Canine Babesiosis. Clinical Pathology. College of Veterinary Medicine, The University of Georgia: http://www.vet.uga.edu/vpp/clerk/Cleveland (Erişim 17.12.2005).

Thierry, F., 2006. Contagious equine metritis: a review. Equine Reproductive Infections: http://www.equinereproinfections.com (Erişim 07.07.2006].

FSAI, 2008. Report of the Implementation Group on Folic Acid Food Fortification to the Department of Health and Children. Food Safety Authority of Ireland: http://www.fsai.ie/assets/0/86/204/cc3c2261-7dc8-4225-bf79-9a47fbc2287b.pdf (Erişim 20.06.2008)

v) Kaynak bilimsel toplantıda sunulmuş bir bildiri ise

Yazarların soyadı ve adının baş harfinden sonra sırasıyla toplantının yılı, bildirinin başlığı, toplantının adı, toplantı yeri, bildiri kitabındaki sayfa no yazılmalıdır.

Örnekler:

Cardinali, R., Rebollar, P.G., Mugnai, C., Dal Bosco, A., Cuadrado, M., Castellini, C., 2008. Pasture availability and genotype effects in rabbits: 2. development of gastro-intestinal tract and immune function of the vermiphorm appendix. In: Proc. 9th World Rabbit Congress, Verona, Italy, 1159-1164.

Mauget, R., Legendre, X., Comizzoli, P., 1998. Assisted reproductive technology in sika deer: a program to preserve endangered deer subspecies. In: Proc. 4th Int. Deer Biology Congress, Kaspovar, 185-186.

e) Tablolar: Kullanım sırasına göre numaralandırılmalı, kısa başlıklarla ifade edilmeli ve metin içinde tablo numarası verilerek (örneğin Tablo 1) atıfta bulunulmalıdır. Tablo başlıkları tablonun üst bölümüne yazılmalıdır. Tabloda kullanılan kısaltmalar ve gerekli açıklamalar tablo altında verilmelidir.

f) Şekil ve Resimler: Metinde kullanılan fotoğraflar, grafikler ve çizimler metin içinde şekil adı ile kullanılmalıdır. Şekiller kullanım sırasına göre numaralandırmalı ve kısa başlıklarla ifade edilmeli, metin içinde şekil numarası verilerek (örneğin Şekil 1) atıfta bulunulmalıdır. Şekil başlıkları şekillerin altında yer almalıdır. Şekillerde istenilen noktaya dikkat çekmek amacıyla; üzerlerine işaret konulmalı ve başlıklardan sonra yer alacak olan şekil altı notta kullanılan işaretler belirtilerek gerekli açıklamalar yapılmalıdır.

IV- Makale Süreci (Kör hakemlik)

Makale başvurusu yalnızca online olarak http://dergipark.gov.tr/maeusabed adresi üzerinden kabul edilmektedir. Sorumlu yazar, makale ile birlikte göndereceği tüm dosyaları yukarıdaki internet adresinde bulunan yeni makale gönder ikonunu tıklayarak sisteme ekleyebilir. Yazarlar dergiye gönderi yapmadan önce kayıt olmalıdır. Kaydolduktan sonra, ana sayfadaki Mehmet Akif Ersoy Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi ikonuna tıklayarak; yazım kurallarına göre düzenlenmiş bilimsel çalışmayı dergi panelindeki Makale Gönder kısmından 4 basamaklı (başlarken, yükleme, kaynaklar, önizleme&gönder) gönderi işlemini yapabilir. Gönderilen makalede ön değerlendirme aşaması sırasında yazar künyeleri, çalışmanın yapıldığı kurum, etik kurul ya da özel izin adres bilgileri gibi tanıtıcı bilgiler içermemelidir. Ön değerlendirmeden (bilimsel nitelik, dil, yazım kuralları kontrolü, İntihal kontrolü iThenticate ve Turnitin programı,) geçen bilimsel çalışmaların hakem ataması yapılır. Sorumlu yazar makalenin hangi aşamada olduğunu sistem panelindeki Süreçteki Makaleler kısmından takip edebilir. Atanan hakemlere, kör hakemlik kuralları çerçevesinde çalışmanın tam metni, şekil, tablo, grafik ve resimleri sistem üzerinden yüklenerek e-posta aracılığıyla makale değerlendirme talebi gönderilir. Hakemler e-posta aracılığıyla gönderilen linke tıklayarak talebi kabul ya da reddederler. Kabul eden hakemler, kararlarını sistem üzerinden en fazla 1 ay içinde sebeplerle birlikte yüklemelidirler. Hakemin önerdiği düzeltme var ise tekrar yazara gönderilir. İstenilen düzeltmeler 1 ay içinde tamamlanıp gönderilmediği takdirde makale otomatik olarak iptal edilecektir. Editör, makalelerin yayın değerliliği ve hakemlerin görüşlerine dayanarak yayına kabul veya red kararını verir. İstenilen düzeltmeler yapıldıktan sonra makale yazar tarafından sisteme tekrar yüklenir. Derginin gizlilik bildiriminde belirtildiği gibi, yazarların kimlik bilgileri ve e-posta adresleri hiçbir şekilde başka amaçlar için kullanılmayacaktır.

Bu dergi; bilimsel araştırmaları halka ücretsiz sunmanın bilginin küresel paylaşımını artıracağı ilkesini benimseyerek, içeriğine anında açık erişim sağlamaktadır.

Mehmet Akif Ersoy University Journal of Health Sciences Institute
INSTRUCTIONS TO AUTHORS

I- Mehmet Akif Ersoy University Journal of Health Sciences Institute General Information

Mehmet Akif Ersoy University Journal of Health Sciences Intitute (MAKU J. Health Sci. Inst.) is the publication of Mehmet Akif Ersoy University Health Sciences Institute. It is published two times annualy. The journal is a peer-reviewed scientific journal in which basic and clinical scientific articles in the field of medical sciences (veterinary, medicine, dentistry, nursing and sports sciences) are published. The language of the journal is English. Papers submitted to the journal should not have been previously published, accepted for publication or be in the process of evaluation for publication in any other journal. This rule does not apply to articles presented as bulletins in scientific meetings and whose summaries are published. In such cases, however, the name, date and place of the meeting in which the paper was presented should be notified. The format of the article should be in accordance with the rules of "Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication (http:/www.icmje.org/)".

On receipt of the paper by the Editorial Board, the paper is evaluated for compliance with the format rules and the authors are informed about the result in four weeks. In the event that the paper is not found to comply with the general publication principles of the journal from the standpoint of either technical characteristics or general scope, the paper is rejected. Alternatively, the author(s) may be asked to re-submit the paper in accordance with the writing requirements. Papers resubmitted are passed through a similar technical examination and, if found to comply with the rules, are passed on for peer review. The paper is sent, without the title, to two reviewers selected by the board, who then assess the paper for scientific content and format compliance. When necessary the Editorial Advisory Board can send the paper to third reviewers. The selection of reviewers is ultimately at the discretion of the editor, associate Editors and/or the editorial board. The appropriate reviewers can be selected from journal's international database of reviewers listing or, if needed; independent reviewers can be determined from inland or abroad. Thereafter the Editorial Advisory Board carries out the final editing, taking the reports of the reviewers into consideration, and, when necessary, communicating with the author(s).

The Editor gives the final decision about the acceptance of the manuscript. The Editorial Board is authorized to publish the paper, return it for correction, or reject it. The assessment process involves research articles, case reports and original articles submitted to the journal. Other types of articles are evaluated directly by the Board. Papers submitted to the journal will not be returned whether they are published or not. The Editor and the Editorial Board have the right to reject, to require additional revision or to revise the format of manuscripts which do not follow the rules. The authors should inform the editorial board if they decide to withdraw the manuscript. The editor may consult editorial executive board about a manuscript if (s) he deems necessary. All the authors should submit a collectively signed statement that there is no conflict of interest regarding scientific contribution or responsibility. The association, establishment, and medication-material supply firms which have given financial, even partial, or material support to the research should be mentioned in a footnote. No fee or compensation will be paid for articles published in the journal.

The Editorial Board assumes that the author(s) are obliged not to submit the paper to another journal before completion of the assessment process. In the "method" section of articles concerned with experimental research on humans or animals, a sentence showing that the informed consent of patients and volunteers has been obtained following a detailed explanation of the interventions carried out on them. In such studies, authors should clearly state the compliance with internationally accepted guidelines (1975 Helsinki declaration revised in 2002 http://www.wma.net/e/policy/b3.htm, Guide for the care and use of laboratory animals-www.nap.edu/catalog/5140.html) issued by the Republic of Turkey Ministry of Health and published in the Official Journal dated 29 January 1993 number 21480 "Regulations Concerning Drug Research", and other more recently published rules laid out in governing statutes. They should forward a copy of the Ethic Committee Approval received from the relevant institution. Standard abbreviations used in the text are written in full when first mentioned. In the use of drugs, the generic names should be written in their Turkish pronunciation spelling

form. Measurement units are given according to the metric system; e.g. written as “mg”, no punctuation is used, in the case of extensions (,,) is used as a separator. Laboratory measurements are reported in International System Units (US; Systeme Internationale; SI).

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Plagiarism policy

Manuscripts submitted to Mehmet Akif Ersoy University Journal of Health Sciences Institute is evaluated in terms of plagiarism. Every submitted article is checked for plagiarism through iThenticate and Turnitin software. When Smilarity Index of the article is above %20, it is sent back to the corresponding author to revise it. If plagiarism is proved after publication of the article, that article will be immediately removed from the website and the concerned authors will be considered ineligible for publication of their articles in Mehmet Akif Ersoy University Journal of Health Sciences Institute.

II- Types and Characteristics of Papers to be Submitted to the Journal

a) Research Articles: These articles are prepared in full accordance with the writing style definitions given below, in which previously unpublished original research data are evaluated. The main text section of the research articles should include (Title, Introduction Materials and Methods, Results, Discussion and Conclusion) sections and (excluding title page, bibliography, tables/figures/pictures) should not exceed 20 pages. If some parts of the research data given in these articles have previously been discussed in another paper, this must be notified without fail when sending the paper and, in addition, reference should be made to the relevant paper within the bibliography.

b) Review Articles: Review Articles should cover subjects falling within the scope of the journal which are of active current interest. They may be submitted or invited. Invited reviews will normally be solicited by the Review's Editor, but suggestions for appropriate review topics may be sent to editor.

c) Case Reports: These are articles which present and discuss the characteristics of one or more cases which have special features and scientific importance from the clinical evaluation, observation or other standpoint. Case presentations include the title page, summary, main text (includes introduction, case and discussion), bibliography,

table/figure/picture sections; subtitles in the main text are organised according to the text content. Abstracts of the case presentations should have 150 words. The main text (excluding title page, bibliography, table/figure/picture) should not exceed 10 pages.

d) Brief Reports: These are articles in which original ideas dealing with important theoretical or practical problems related to a specific subject are presented and discussed. Original articles include a title page, summary,

main text, bibliography, table/figure/picture sections; subtitles in the main text are organised according to the text content. The main text of original articles (excluding title page, bibliography, table/figure/picture) should not exceed 10 pages.

e) Special Sections:

1. Letters to the Editor: These articles include evaluation and criticisms of articles published in the journal. These are published together with the responses of the author(s) of the paper concerned where possible. Letters to the Editor may not exceed 5 pages.

2. Meeting news/notes: These articles introduce scientific meetings held or to be held on subjects within the scope of the journal. The paper may not exceed 1 page.

3. Journal news: These articles introduce scientific journals being published within the scope of the journal. The paper may not exceed 1 page.

4. Introduction of websites: These articles introduce websites relevant to the scope of the journal. These articles may not exceed 1 page.

5. Book/Thesis Section: These articles introduce books/theses published on subjects related to the scope of the journal and may not exceed 3 pages.

III- Preparation of Manuscripts

Papers to be submitted to the journal include the sections of title page, abstract, main text, references and tables/figures/pictures. Articles submitted for publication in the journal should follow the following formal principles: The text should be prepared in Microsoft Word program in Times New Roman font style with a font size of 12 font, black and 1.5 line. All side of the paper, page margins should be as 2.5 cm. Line numbers should be added to the beginning of the page.

Anatomical terms should be used as written in Latin. Running title (not exceed 40 characters) of the manuscript should add to title page. The name of the clinic, department / science, institute and institution should be stated.

a) Title Page: should contain the category, the title (only first letter capital), the names of the authors (only the first letters capital), the institution (s) where they work (indicated with numbered footnotes), corresponding author (address, phone, fax numbers and e-mail address). Corresponding author is indicated by an asterisk (*). If the article was previously presented at a scientific meeting, the name, date and place of the meeting must be stated.

b) Main Text: The main text of the paper is organised under the subtitles of Abstract and Keywords, Introduction, Materials and Methods, Results and Discussion.

Abstract and Keywords: This is written in two languages, Turkish and English, and also includes the title of the paper. The abstract is consists of 200 words. The abstract should bring out the main points of the manuscript and should include the following information: objective, the animals or sample population involved, design, the materials and methods used, the main results, a brief conclusion and clinical relevance, where applicable. They should be comprehensible to readers before they have read the paper, and abbreviations and reference citations should be avoided. At the end of the abstract, at least 3, at most 5 keywords in both languages are included.

In the introduction, following a brief statement of basic information and justifications which constitute the basis of the paper, the objective is clearly given in the last paragraph. If necessary, the "method" section may be organised according to sub-titles such as research/patient/ test group, instruments, application and statistical analysis. This section should be written with clarity so that a person not involved in the study may easily understand. Results summarize the findings of the study and, when necessary, basic findings are supported with tables and figures. In the discussion section, the findings of the study are discussed in the light of relevant national and international studies; this section includes discussion of original findings, not a general review.

c) Acknowledgements: When considered necessary, author(s) may add brief acknowledgements in a few sentences to those whose contributions to the paper are not at author level but deserve to be mentioned. Here, the contributions of those acknowledged (e.g. financial or equipment aid, technical support etc) are clearly stated (e.g. "scientific counseling", "editing of the draft", "data collection", "participation in clinical research" etc).

d) Bibliographic References:

All citations in the text should refer to: the year of publication of the reference should be indicated in parentheses after the surname of the author or authors.

Examples: Bell (2005), Nielsen and Engberg (2006), Doyle et al. (2007) were indicated that.....

The name of the author and the year of publication should be stated in parentheses at the end of the sentence.

Examples: ...were detected as 23% of the samples (Bell, 2005); ....were detected as 23% of the samples (Nielsen and Engberg, 2006); ...were detected as 23% of the samples (Doyle et al., 2007).

In case of more than one reference, references should be arranged chronologically.

Examples: ....were reported that... (Bell, 2005; Nielsen and Engberg, 2006; Doyle et al., 2007).

More than one reference from the same author(s) in the same year must be identified by the letters 'a', 'b', 'c', etc., placed after the year of publication.

Examples: (Bell, 2005a; Bell, 2005b; Bell, 2005c …)

The authors can use below formatted style link in mendeley:

http://csl.mendeley.com/styles/529990351/sagbilensderg

References should be written in alphabetical order. Reference style, the authors' names and year of publication should be written in bold. Source list should be prepared as follows:

i) Examples of journal articles:

Cohen, N.D., Vontur, C.A., Rakestraw, P.C., 2000. Risk factors for enterolithiasis among horses in Texas. Journal of the American Veterinary Medical Association 216, 1787-1794.

Rajmohan, S., Dodd, C.E., Waites, W.M., 2002. Enzymes from isolates of *Pseudomonas fluorescens* involved in food spoilage. Journal of Applied Microbiology 93, 205-213.

Ono, K., Yamamoto, K., 1999. Contamination of meat with *Campylobacter jejuni* in Saitama, Japan. International Journal of Food Microbiology 47, 211-219.

For articles that are accepted for publication and have a DOI number but not yet published; DOI number must be specified at the end of the article.

McGregor, B.A., Butler, K.L., 2014. The value of visual fleece assessment in addition to objective measurements in identifying Angora goats of greater clean mohair production. Small Ruminant Research, in press (DOI: 10.1016/j.smallrumres.2014.04.001).

ii) Books:

Combs, G.F., 1992. The Vitamins: Fundamental Aspects in Nutrition and Health. Academic Press, San Diego.

Concannon, P.W., 1986. Physiology and Endocrinology of Cannine Pregnancy. In: Marrow, D.A. (Ed.), Current Therapy in Theriogenology. Philadelphia, W.B. Saunders Company, pp. 491-497.

Perkins J.B., Pero, J., 2002. Vitamin biosynthesis. In: Sonenshein, A., Hoch, J., Losick, R. (Eds.), Bacillus subtilis and Its Closest Relatives: from Genes to Cells. ASM Press, Washington D.C., pp. 271-286.

Kramer, J.M., Gilbert, R.J., 1989. Bacillus cereus. In: Doyle, M.P. (Ed.), Foodborne Bacterial Pathogens. Marcel Dekker, New York, pp. 22-70.

iii) Thesis:

Bacınoğlu, S., 2002. Boğa spermasında farklı eritme süreleri ve eritme sonrasında oluşturulan soğuk şoklarının spermatolojik özelliklere etkisi. Doktora Tezi, İstanbul Üniversitesi Sağlık Bilimleri Enstitüsü, İstanbul.

iv) Web site or author is an institution:

FDA, 2001. Effect of the use of antimicrobials in food-producing animals on pathogen load. Systematic review of the published literature. http://www.fda.gov/cvm/antimicrobial/PathRpt.pdf (Accessed: 14.12.2001)

Cleveland, C.W., Peterson, D.S., Latimer, K.S., 2005. An Overview of Canine Babesiosis. Clinical Pathology. College of Veterinary Medicine, The University of Georgia: http://www.vet.uga.edu/vpp/clerk/Cleveland (Accessed: 17.12.2005).

Thierry, F., 2006. Contagious equine metritis: a review. Equine Reproductive Infections: http://www.equinereproinfections.com (Accessed: 07.07.2006).

FSAI, 2008. Report of the Implementation Group on Folic Acid Food Fortification to the Department of Health and Children. Food Safety Authority of Ireland:http://www.fsai.ie/assets/0/86/204/cc3c2261-7dc8-4225-bf79-9a47fbc2287b.pdf (Accessed: 20.06.2008).

v) Paper presented at a scientific meeting

Cardinali, R., Rebollar, P.G., Mugnai, C., Dal Bosco, A., Cuadrado, M., Castellini, C., 2008. Pasture availability and genotype effects in rabbits: 2. development of gastro-intestinal tract and immune function of the vermiphorm appendix. In: Proc. 9th World Rabbit Congress, Verona, Italy, 1159-1164.

Mauget, R., Legendre, X., Comizzoli, P., 1998. Assisted reproductive technology in sika deer: a program to preserve endangered deer subspecies. In: Proc. 4th Int. Deer Biology Congress, Kaspovar, 185-186.

e) Tables: Each table is printed on a separate page and numbered according to the sequence of referral within the text (Table 1). Each table has a title and, when necessary, explanations are given under the table (e.g. abbreviations given in the table). Each table should be understandable without need for referral to the text. Each table should be referred to in the text..

f) Figures and Pictures: Figures should be numbered according to the order of use and should be expressed with short titles.Figures should be numbered in the text (Figure 1). Letters, numbers and symbols within the figure should be clear and readable when downsized for printing.Each figure should be referred to in the text..

IV- Submission of Articles (Blind Peer-Review)

The article submission is only accepted online via 'http://dergipark.gov.tr/maeusabed' The Corresponding authors, all the files can be added to the system by clicking the submit new article icon at the above address. Authors must register on Dergipark system before submitting a manuscript. After signing up, clicking Mehmet Akif Ersoy University Journal of Health Sciences icons on the main page, the manuscript written according to the guide for authors is submitted in 4 steps (start, submission, reference, preview & submit). The submitted manuscript must not contain any identifying information, such as author information, institution, ethics committee or special permit address, during the preliminary evaluation phase. The manuscript that pass the preliminary evaluation (paper scientific qualification, language, conformity to Guide for author and checking plagiarism via

iThenticate and Turnitin program,) are assigned to the Reviewers. The corresponding author can follow the article evaluation process from the section on the Articles in the Process. According to the blind peer-review rules, the main text, tables, graphics and pictures of the manuscript are uploaded via the system and sent to the appointed reviewers for an article evaluation request via e-mail. The reviewers accept or reject the request by clicking on the link sent via e-mail. The reviewers who accept it have to upload their decisions together with the reasons within a maximum of 1 month via the system. If the correction requested by the Reviewer is sent back to the author. If the requested corrections are not completed within 1 month, the article will be automatically canceled. After the desired corrections are made, the article is uploaded back to the system by the author. The editor makes decisions to accept or reject papers based on their opinion of the papers' publication worthiness and reviewers' comments. As stated in the privacy statement, authors' identity information and e-mail addresses will not be used for any other purpose.

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Dergisi

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Araştırma Makaleleri / Research Articles

MAKU J. Health Sci. Inst. 2023, 11(1): 173-182.
doi: 10.24998/maeusabed.1262497

Mehmet Akif Ersoy University
Journal of Health Sciences Institute
http://dergipark.gov.tr/maeusabed

Research Article / Araştırma Makalesi

Comparison of Neck Awareness, Physical and Psychosocial Parameters in Inactive University Students with and without Neck Pain

Boyun Ağrısı Olan ve Olmayan İnaktif Üniversite Öğrencilerinde Boyun Farkındalığı, Fiziksel ve Psikososyal Parametrelerinin Karşılaştırılması

Raziye ERKAN[1*], Emine ASLAN TELCİ[2], Sebahat Yaprak ÇETİN[3],Fatmanur ALTIN[4]

[1]Burdur Mehmet Akif Esoy University, Rectorate Department of Physical Education and Sports, Burdur, Türkiye
[2]Pamukkale University, Faculty of Physical Therapy and Rehabilitation, Department of Physical Therapy and Rehabilitation, Denizli, Türkiye
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Abstract: The aim of the study was to compare neck awareness, muscular endurance, mental state and self-efficacy parameters in young adults with and without neck pain and to examine the relationship of awareness with pain intensity, muscular endurance and anxiety and depression in the group with neck pain. **A** total of 104 students with neck pain (n=41) and without neck pain (n=63) with a mean age of 22.85 ± 3.53 years were included in the study. Visual Analog Scale (VAS), Cervical Deep Flexor Muscle Endurance Test, Hospital Anxiety and Depression Scale (HADS) and Fremantle Neck Awareness Questionnaire (FreBAQ) were used to collect the data. When the groups were compared in terms of physical and psychosocial data, it was determined that the group with neck pain was negatively affected compared to the group without neck pain in terms of all parameters ($p<0.05$). In the group with neck pain, there was a positive correlation between the FreBAQ and the HAD scale values($p<0.05$); there was no correlation between deep flexor neck muscular endurance and neck pain($p>0.05$). According to the results of the study, neck pain negatively affects physical and psychological factors in university students and neck awareness is especially associated with anxiety and depression.

Keywords: Young Adult, Neck Pain, Neck Awareness, Mental State, Muscular Endurance.

Öz: Çalışmanın amacı, boyun ağrısı olan ve olmayan genç yetişkin gruplarda boyun farkındalığı, kassal endurans, ruhsal durum ve öz-yeterlilik parametrelerin karşılaştırılması ve boyun ağrılı grupta farkındalığın ağrı şiddeti, kassal endurans ve anksiyete depresyon ile ilişkisinin incelenmesidir. Çalışmaya yaş ortalaması 22,85 ± 3,53 yıl olan, boyun ağrılı (n=41) ve boyun ağrısı olmayan (n=63) toplam 104 öğrenci dahil edilmiştir. Çalışmanın verilerinin toplanmasında Görsel Analog Skala (GAS), Servikal Derin Fleksör Kas Endurans Testi, Hastane Anksiyete ve Depresyon Ölçeği (HADÖ) ve Fremantle Boyun Farkındalık Anketi (FreBFA) kullanılmıştır. Gruplar fiziksel ve psikososyal veriler açısından karşılaştırıldıklarında tüm parametreler açısından boyun ağrısı olan grubun boyun ağrısı olmayan gruba göre olumsuz yönde etkilendiği belirlenmiştir ($p<0,05$). Boyun ağrısı olan grupta, Fremantle Boyun Farkındalık Testi ile HAD ölçeği değerleri arasında pozitif bir korelasyon olduğu($p<0,05$); derin fleksör boyun kassal endurans ile boyun ağrısı arasında ise bir korelasyon olmadığı bulunmuştur($p>0,05$). Çalışmanın sonuçlarına göre boyun ağrısının üniversite öğrencilerinde fiziksel ve psikolojik faktörleri olumsuz yönde etkilediği ve boyun farkındalığının özellikle anksiyete ve depresyon ile ilişkili olduğu görülmüştür.

Anahtar Kelimeler: Genç Yetişkin, Boyun Ağrısı, Boyun Farkındalığı, Ruhsal Durum, Kassal Endurans.

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Introduction

Chronic neck pain is a common problem affecting 75% of the general population (Fejer et al., 2006). One third of the young adult population complains of neck pain at least once a week (Hogg-Johnson et al., 2008). In a study conducted in university students aged 18- 25 years in our country, it was reported that the lifetime incidence of neck pain in students was 43.70% (Kurtaran et al., 2019). According to the results of studies on chronic pain prevention, neck pain ranks first among the reasons for seeking health care (Fricton et al., 2015). Within a bio-psycho-social framework, a number of factors cause neck pain, and these factors may also contribute to the transition from an acute pain state to a chronic pain state (Nagrale et al., 2010, Lau et al., 2011).

Mechanical causes (Hidelgo et al., 2017), myofascial disorders in the neck/shoulder region (Gallego et al., 2020) are among the factors that cause neck pain. Neck muscle endurance has been found to be associated with chronic neck pain (Schomacher et al., 2013, Kahlaee et al., 2017).Factors such as increased long-term use of phones and computers in inappropriate positions in young populations cause postural disorders and musculoskeletal pain (Sihawong et al., 2011, Kim et al., 2015). It has been reported that the effect of impaired body perception on the severity of the clinical condition makes a more significant contribution than other factors affecting the clinical condition. In case of impaired body perception, an unconscious awareness occurs and conscious perception is impaired (Wand et al., 2016). Studies have shown that improving habitual postural patterns can improve musculoskeletal pain or prevent further deterioration. However, changing habitual patterns requires awareness (Cramer et al., 2018). Researchers state that chronic pain is associated with impaired body awareness. This suggests that mindfulness should be examined in chronic pain (Wand et al., 2016).

How the body perceives and experiences pain has recently attracted attention. The response to pain is related to perceived health, tolerance, and beliefs about the risk associated with a particular movement or activity (Wiech et al., 2004). Self-efficacy belief is an important factor affecting pain response (Bandura, 1994). In addition, self-efficacy is also effective in the formation and change of patients' health-related behaviors (Yıldırım et al., 2010). There are examples of studies examining patient behaviors related to self-efficacy in the field of health, but there are not many studies on neck pain.

Neck pain may be caused by psychosocial factors as well as physical factors (Linton 2000). Emotional states may affect body positions and functions of extremities. The presence of depression and anxiety is thought to be a factor in the onset and chronicity of neck pain and in increasing the severity of pain (Shahidi et al., 2015). Therefore, it is important to measure the presence of anxiety and depression in patients.

Health-related behaviors acquired in the early period of life affect the risks for lifestyle-related disorders in the future and the incidence of preventable diseases that may cause problems in later ages (Von Bothmer et al., 2005).In our country, university students represent a large portion of the young adult population (Savcı et al., 2010). It is important to identify potential pain factors among young adults and thus prevent the development of neck pain later in life (Kanchanomai et al., 2011).

The primary aim of this study was to compare neck awareness, muscular endurance, anxiety-depression and self-efficacy in young adults with and without neck pain. The secondary aim was to investigate the relationship of mindfulness with pain intensity, muscular endurance, self-efficacy, anxiety and depression in a group with neck pain.

Materials and Methods

The population of the study was Pamukkale University Physiotherapy and Rehabilitation Faculty students. The sample of the study consisted of volunteer students who met the study criteria in this population.

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The study was conducted on inactive volunteer students between the ages of 18-25. In order to carry out the study, all classes were informed by the researchers about the purpose of the study and the inclusion criteria and it was emphasized that the study was voluntary. Individuals who had neck pain for at least 3 months and scored above 0 on the Visual Analog Scale (n=41) and individuals who had not had neck pain for the last 6 months (n=63) were included participate in the study.

Exclusion criteria included a history of previous surgery on the spine, malignant conditions, neurologic and orthopedic diagnoses, musculoskeletal pain apart from cervical region and any condition that posed an obstacle to perform the assessments. At the same time, individuals with improve musculoskeletal pain other than the cervical region were exclusion criteria for both groups. There were no individuals who met the exclusion criteria among the students who volunteered to participate in the study.

Ethical approval was obtained from Pamukkale University Non-interventional Clinical Research Ethics Committee for the conduct of the study with the decision number 60116787- 020/92293 dated 25.12.2019. The study was conducted in accordance with the principles defined in the Declaration of Helsinki. Informed written consent was obtained from all participants.

Sociodemographic Data Form. Participants' age, gender, height, body weight, and body mass index were recorded on the socio-demographic form.

Evaluation of pain intensity. Pain intensity was assessed with the Visual Analog Scale (VAS). Participants were asked to mark the intensity of pain they felt on a 10 cm long horizontal line. The point marked on the line was measured with a ruler and the GAS value was recorded in cm (0 cm: No pain; 10 cm: Intolerable pain) (Wewers et al., 1990).

General Health Status Assessment: To assess general health status, participants were asked the question "How would you rate your general health status?" and were asked to mark one of the answers "excellent, very good, fair, poor, poor" (Cavlak et al., 2009)

Evaluation of cervical region deep flexor muscle endurance: The 'Cervical Region Deep Flexor Muscle Endurance Test' was used for the evaluation. The test was performed in supine hook position. Individuals were asked to maximally retract the chin (*chin tuck* position) and lift the head and neck approximately 2.5 cm from the lying position while maintaining the retraction isometrically. The students were asked to maintain this position for as long as possible and the time to maintain the position was recorded in seconds. The test was terminated if the test position disappeared, if there was a sudden and severe increase in pain or if the person did not want to continue the test (Harris et al., 2005)

Assessment of Neck Awareness: Neck awareness was assessed with the Fremantle Neck Awareness Questionnaire. The Turkish validity and reliability of the questionnaire developed by Wand et al. was performed by Onan et al. (ICC0.711). The questionnaire is a Likert-type scale that evaluates individual-specific altered perception. The 9 statements that make up the scale are graded from 0 = Never/never feel this way, 1 = Rarely feel this way, 2 = Sometimes, or some times feel this way, 3 = Often feel this way, 4 = Always or most of the time feel this way. The total score ranges from 0-36, with an increase in score indicating a poor prognosis (Wand et al., 2016, Onan et al., 2019).

Assessment of Self-Efficacy: General Self-Efficacy Scale was used in the study. The Turkish validity and reliability of the General Self-Efficacy Scale developed by Sherer et al. (1982) was conducted by Yıldırım and İlhan (2010) (Yıldırım 2010). Items 2, 4, 5, 6, 7, 10, 11, 12, 14, 16 and 17 in the 17-item Likert format scale are reverse scored and the score of each question varies between 1-5. The total score of the scale can vary between 17-85; the higher the score, the higher the self-efficacy belief (Yıldırım 2010).

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Assessment of anxiety and depression: The Hospital Anxiety and Depression Scale (HAD) developed by Zigmond et al. in 1983 was used in the study (Zigmond et al., 1983). The HAD consists of 14 items and assesses 2 different psychological states: anxiety and depression. The questionnaire is scored between 0 and 21 and the higher the score, the more mood disturbance. The Turkish validity and reliability of the scale was conducted by Aydemir et al. in 1997 (Aydemir et al., 1997).

Data Analysis

Data analysis was performed with 22.0 SPSS package program. In the analysis of the demographic characteristics of the participants, % distributions, mean and standard deviations were given. According to whether the other data were normally distributed or not, the data of the groups were compared with the T test in independent groups from parametric tests or Mann-Whitney U test from non-parametric tests. $p<0.05$ was accepted as significant. Pearson correlation analysis was used if the data were normally distributed, and Spearman correlation analysis was used when the data were not normally distrubuted.

Results

The study included 44 female and 30 male students with a mean age of 22.85 ± 3.53 years. The mean pain duration of the students in the neck pain group was 20.53 months, ranging from 3 months to 72 months, and the mean pain intensity was 4.86 according to the VAS pain scale. There was no difference between the socio-demographic data of individuals with and without neck pain ($p>0.05$) (Table 1).

Table1. Comparison of socio-demographic data of individuals with and without neck pain

	Neck pain (n=41)		No neck pain (n=63)		p
	$\bar{x}$	S.S.	$\bar{x}$	S.S.	
Age (years)	23,17	3,87	22,63	3,29	0,450
Body weight (kg)	64,87	11,91	64,42	14,52	0,867
Height (cm)	168	8	167	9	0,720
BMI (kg/m)²	22,84	3,17	22,75	3,35	0,891
Duration of pain (months)	20,53	11,64	-	-	
	n	**%**	**n**	**%**	
Gender	30	73,2	44	69,8	0,717
Woman Male	11	26,8	19	30,2	

BMI: Body Mass İndex ***p<0.05** *Independent samples T test

.

Table2. Comparison of general health status of individuals with and without neck pain

General Health Status Questionnaire	Neck pain (n=41)		No neck pain (n=63)		p
	n	%	**n**	%	
Weak	1	2,4	0	0	**0,009***
Middle	19	46,3	15	23,8	
Very good	18	43,9	40	63,5	
Perfect	3	7,3	8	12,7	

***p<0.05** * Independent samples T test.

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The general health status of the group without neck pain was found to be better than the group with neck pain (p<0.05), (Table 2).

When the groups were compared in terms of physical and psychosocial data, a significant difference was found in favor of the group without neck pain according to the results of deep flexor neck endurance test, HADE anxiety, depression sub-parameters and total value and FreBAQ questionnaire (p<0.05). There was no statistically significant difference between the two groups in terms of self-efficacy scores (p>0.05) (Table 3).

In the neck pain group, a positive correlation was found between FreBAQ value and HADE-anxiety, HADE-depression and HADE-total values (p<0.05). There was no statistically significant relationship between FreBAQ value and deep neck flexor muscle endurance and neck pain (p>0.05) (Table 4).

Table3. Comparison of Physical and Psychosocial Data of Students with and without Neck Pain

General Health Status Questionnaire	Neck pain (n=41)		No neck pain (n=63)		p
	n	%	**n**	%	
Weak	1	2,4	0	0	**0,009***
Middle	19	46,3	15	23,8	
Very good	18	43,9	40	63,5	
Perfect	3	7,3	8	12,7	

p<0.05 *Independent groups T test; **Mann Whıtney-U, HADE: Hospital Anxiety and Depression Scale.

Table 4. The Relationship Between Fremantle Neck Awareness Questionnaire Value and Pain Severity, Anxiety and Depression, Self-Efficacy and Muscular Endurance in Individuals with Neck Pain.

	VAS Activity	HADE anxiety	HADE depression	HADE total	Neck endurance	Self- efficacy
Neck Awareness Scale	0,310	0,001**	0,015*	0,003**	0,912	-0,081

p<0.05 HADE: Hospital Anxiety and Depression Scale, VAS: Visual Analog Scale.

Discussion

The first results of this study showed that neck pain negatively affected physical, psychological parameters and neck awareness in young adults compared to young adults without neck pain. Another result we obtained from our study was that there was a relationship between neck awareness and psychological parameters in young adults with neck pain.

In recent years, there has been an increase in researches on how neck pain affects the cervical motor system, posture and movement (Blomgren et al., 2018). Most studies have examined the relationship between neck pain and flexor muscle endurance and generally found that flexor muscle endurance is low in people with neck pain (Piper et al., 2009, Edmondston et al., 2011, Parazza et al., 2014). Falla et al. demonstrated the loss of endurance of deep cervical flexors using surface electromyography in patients with chronic neck pain and found that this condition caused pain (Falla et al., 2004). In the recent study, in parallel with the literature, it was determined that cervical

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region flexor muscle endurance was lower in young individuals with neck pain compared to those without neck pain. We thought that the inclusion of training for cervical muscle endurance, which decreased with neck pain especially in young individuals, in the rehabilitation program may be protective against physical effects such as postural problems that may be seen in later ages.

In the literature, it is known that one of the underlying causes of chronic neck pain is psychosocial reasons and it is stated that these reasons should be investigated (Blozik et al., 2009 Carroll et al., 2008). Studies have shown that anxiety and depression symptoms are more common and severe in individuals with neck pain (Demyttenaere et al., 2007, Liu et al., 2014, Dimitriadis et al., 2015). Carroll et al. found a strong correlation between depressive symptoms and the onset of a pain episode and reported that the most depressed group had a fourfold increased risk of neck pain compared to the least depressed group (Carroll et al., 2008). Studies on psychological factors in neck pain have emphasized that psychological factors may cause neck pain or neck pain may cause psychological problems (Linton et al., 2000). In a study examining the relationship between neck pain, anxiety and depression in 448 patients, it was shown that depression and anxiety were closely related to recurrent neck pain (Blozik et al., 2009). In our study, anxiety and depression symptoms were found to be higher in the group with neck pain ($p<0.05$). The recent results are consistent with the literature. This may be due to the fact that patients with prolonged and severe neck pain are negatively affected in terms of mood.

It has been reported that self-efficacy is associated with patients' ability to continue daily activities in the face of obstacles such as pain; therefore, it is an important predictive factor for pain (Nicholas et al., 2007). Self-efficacy has been found to significantly mediate the relationship between pain and disability (Lee et al., 2015). Greater self-efficacy may enable individuals to recognize and reduce some of the underlying causes of musculoskeletal pain, such as poorly coordinated posture and movement habits, excessive muscle tension, and associated psychological distress (Woodman et al., 2018). Studies have shown that neck pain and self-efficacy are interrelated (Chiarotto et al., 2018, Monticone et al., 2021). The recent , no significant difference was found between the groups with and without neck pain and the general self-efficacy scale. The reasons for this may be explained by the fact that the individuals who make up the population of my study are young university students; in other words, apart from the pain, they are young individuals, and the opportunities provided by university education, such as academic and social opportunities, are equivalent, and different situations enable them to have the same level of self-efficacy.

Studies have reported that chronic pain is associated with the deterioration of the perceived body image of painful body parts and that this deterioration leads to an increase in chronic pain severity and prolongation of pain duration, and that pain severity decreases as awareness increases (Moreira et al., 2017, Cramer et al., 2018). In the first of two different studies examining the contribution of neck awareness to the relationship between neck awareness and chronic neck pain in the literature, it was concluded that body awareness was affected in individuals with chronic neck pain (Özel 2022). The recent, it was determined that the awareness levels of students with neck pain were lower. Another study found that pain intensity was weakly associated with neck awareness in individuals with chronic neck pain (Şimşek et al., 2022 The recent, it was found that there was no difference between awareness level and pain intensity. It was thought that the reason for the difference between the two studies in terms of pain intensity may be due to the sociodemographic characteristics of the subjects participating in the study.

When the literature is examined, it is seen that there are few studies examining the relationship between muscle endurance and neck awareness and different opinions have been put forward on

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this issue. In Dere's study, it was found that there was a relationship between neck awareness and cervical flexor, trunk, upper extremity and scapular region muscular endurance in individuals with neck pain (Dere 2021). Şimşek et al. found a weak positive correlation between neck pain and decreased neck awareness (Şimşek et al., 2022). In a different study conducted with patients with chronic neck pain, no relationship was found between neck awareness and cervical muscle endurance in individuals with chronic neck pain (Özel 2022). Similarly, in our study, there was no relationship between muscular endurance and awareness. It is thought that this may be related to the evaluation of not only cervical endurance but also body parts adjacent to this region with neck awareness.

Anxiety can exacerbate chronic pain, while reducing anxiety and anxiety levels can mediate recovery (Linton 2000). In the study by Özel et al. a weak positive relationship was found between neck awareness and anxiety, while no relationship was found between neck awareness and depression (Özel 2022). The researchers associated this situation with the borderline anxiety and depression of the individuals with neck pain who participated in the study. Onan et al. stated that chronic neck pain contributes to the deterioration of neck awareness and perception in individuals (Onan et al., 2019). According to the results of our study, neck awareness was found to be positively associated with anxiety and depression symptoms. The relationship we found between awareness and mental status in young individuals reveals the importance of psychological support with a multidisciplinary approach as well as interventions for physical parameters in individuals with neck pain.

The most important limitation of our study was that possible postural errors such as head posture, which may be related to neck awareness in individuals with neck pain, and severity of disability were not examined. In the literature, interest in examining neck awareness, especially with patient-reported questionnaires, has recently increased. In order to determine the effect of neck pain on awareness, future studies should examine various factors that may affect neck awareness in populations with different characteristics such as age and gender. The strength of our study was that it wass a study examining the physical and psychosocial effects of neck pain on neck awareness in young adult groups. It was thought that defining neck awareness and psychosocial status in young adult groups will help to determine the necessary treatment programs to take precautions for neck pain later in life.

Conclusion

According to the results of this study, neck endurance and neck awareness levels were lower and anxiety and depression levels were higher in students with neck pain compared to students without neck pain. In addition, neck awareness was associated with anxiety and depression in young people with neck pain. The results of this study revealed that muscular endurance, emotional state and neck awareness should be included in the evaluation parameters of young individuals with neck pain and the importance of developing appropriate treatment strategies with a multidisciplinary approach.

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Research Article / Araştırma Makalesi

Investigation of Oxidative/Antioxidant Effects of Turmeric (Curcuma longa L.) Supplementation on Heart Tissue in Adult Rats

Erişkin Ratlarda Zerdaçal (Curcuma longa L.) Takviyesinin Kalp Dokusundaki Oksidan/Antioksidan Etkilerinin İncelenmesi

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Abstract: In present study, the effects of curcumin supplementation on oxidative stress and antioxidant defense system in heart tissue in adult rats were investigated. Sixteen rats (8-weeks-old) were selected and divided into two groups. The first group is the experimental group and these rats (n=8) were gavaged with curcumin, dissolved in corn oil, at a dose of 300 mg/kg per day for 28 days. The second group is the control group, rats in this group were given curcumin and equal amount of corn oil to eliminate the porter effect. Euthanasia was performed and total antioxidant capacity (TAS), total oxidant capacity (TOS), malondialdehyde (MDA) and glutathione (GSH) levels were analyzed from heart tissues. Curcumin supplementation resulted in significantly increased GSH levels (P<0,05). However, curcumin supplementation decreased MDA levels although it was not statistically significant (P>0.05). The total antioxidant capacity (TAS) and total oxidant capacity (TOS) ratios were found to be statistically significant. In the other group supplemented with curcumin, MDA levels tended to decrease compared to the control group, and there was no statistically significant difference between the two groups. Curcumin supplementation protects the heart tissue against oxidative damage and strengthens the antioxidant defense system in adult rats.

Keywords: Curcumin, Antioxidant, Oxidative Stress, Heart.

Öz: Bu çalışmada, erişkin ratlarda zerdaçal (kurkumin) takviyesinin kalp dokusundaki oksidatif stres ve antioksidan savunma sistemi üzerinde meydana getirdiği etkileri incelendi. Çalışmada 8 haftalık 16 adet rat kullanılmış ve bu ratlar iki gruba ayrılmıştır. İlk grup olan deney grubundaki ratlara (n=8) 28 gün süresince günde 300 mg/kg dozunda kurkumin (C1386; Sigma Chemical, St. Louis, MO) mısır yağı içinde çözdürülerek ağızdan gavaj yöntemi ile verildi. İkinci grup olan kontrol grubundaki ratlara ise portör etkisini yok etmek için kurkumin ile eşit miktarda mısır yağı verildi. Ötenazi gerçekleştirildikten sonra kalp dokuları alınarak total antioksidan kapasiteleri (TAS), total oksidan kapasiteleri (TOS), malondialdehit (MDA) ve glutatyon (GSH) seviyeleri analiz edildi. Kurkumin takviyesi GSH seviyelerini önemli ölçüde artırmıştır (P<0,05). Bununla birlikte, kurkumin takviyesi istatistiksel olarak anlamlı olamamasına rağmen MDA seviyelerini azaltmıştır (P>0,05). Total antioksidan kapasitesi (TAS) ve total oksidan kapasitesi (TOS) oranları istatistiksel olarak anlamlı bulundu. Kurkumin takviyeli diğer grupta MDA seviyeleri kontrol grubuna oranla azalma eğilimi göstermiş olup iki grup arasında anlamlı istatistiksel bir fark bulunmamıştır. Kurkumin takviyesi erişkin ratlarda kalp dokusunu oksidatif hasara karşı korumakta ve antioksidan savunma sistemini güçlendirmektedir.

Anahtar Kelimeler: Kurkumin, Antioksidan, Oksidatif Stres, Kalp.

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Introduction

Curcumincuma longa is a plant from the Zingiberaceae family, mostly found in India and China. Curcumin, obtained from the tubers of the plant, has been used as a spice, medicinal drug and cosmetic product for many years. Curcumin (diferuloylmethane) is a yellow pigmented product of *Curcumincuma longa* (turmeric). Turmeric, which is used as a colorant in foods, contains tetrahydrocurcumin, a heat-resistant, odorless, antioxidant compound. Curcumin has a wide spectrum of effects including anti-inflammatory, antioxidant, anticarcinogenic, antimutagenic, anticoagulant, antidiabetic, antibacterial, antiviral and neuroprotective effects (Choudhuri et al., 2002; Naik et al., 2011).

The antioxidant property of curcumin prevents damage caused by exposure to harmful factors such as alcohol, drugs, radiation and heavy metals. Because it is a good free radical scavenger and hydrogen donor. It is especially bonded to metals such as iron and copper and acts as an iron clamp. Curcumin is not very toxic and has limited bioavailability. Curcumin is a strong hydroxyl radical scavenger and also scavenges superoxide radicals. Protects DNA (Deoxyribo Nucleic Acid) from oxidative damage due to its ability to capture free radicals (Reddy and Lokesh, 1994; Sreejayan, 1997).

Due to these properties, the protective effects of curcumin on the cardiovascular system have recently attracted attention (Dkhar and Sharma, 2010; Duan et al., 2012; Miriyala, 2007; Naik et al., 2011). It has been reported in the literature that curcumin protects smooth and endothelial muscle cells from damage, prevents cardiac toxicity and damage, protects the heart against ischemic damage, and accelerates cardiac and vascular regeneration (Duan et al., 2012; Morimoto et al., 2008; Nirmala et al., 1999; Srivastava and Mehta, 2009; Venkatesan, 1998; Yeh et al., 2005). Although it is known that curcumin supplementation improves oxidative damage, there are not many studies examining its effects on oxidative damage and antioxidant defense in heart tissue. Our aim in this study was to investigate the oxidant/antioxidant effects of curcumin supplementation on the heart tissue of adult rats and to contribute to the literature on this subject.

Material and Method

Approval was obtained from Burdur Mehmet Akif Ersoy University Experimental Animals Local Ethics Committee and the study was carried out in the same center. In the study, 16 adult rats (no gender priority) of about 8 weeks old and weighing 300-450 g, obtained from Burdur Mehmet Akif Ersoy University Experimental Animal Production and Experimental Research Laboratory, were used. During the study, the rats were kept in rooms with a 12-hour dark/light cycle at 21±2 °C room temperature, 50% humidity.

Experimental animals were fed *adlibitum* with standard feed and tap water with 4 animals in each cage. Rats were randomly selected and divided into 2 experimental groups (n=8 in each group).

1. Control Group (K1): The group fed only corn oil throughout the study.
2. Experimental Group (D1): The group fed with curcumin at a dose of 300 mg/kg/day in the study.

Curcumin supplementation: In accordance with the literature, the dose amount was calculated by making a preliminary study. The rats in group D1 (n=8) were given 300 mg/kg/day curcumin (C1386; Sigma Chemical, St. Louis, MO) dissolved in corn oil and injected by oral gavage for twelve days. The rats in the K1 group (n=8) were given equal amount of curcumin and corn oil to eliminate the carrier effect. Rats were weighed daily for twelve days before curcumin or carrier supplementation. Taking tissue samples: One day after curcumin or carrier feeding on the last day, blood samples were taken from the hearts of rats

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under 50 mg/kg ketamine + 10 mg/kg xylazine anesthesia. After the samples were taken, euthanasia was performed by cervical dislocation method. Heart tissues were rapidly removed after euthanasia. Tissues were washed with cold saline and placed in liquid nitrogen. Tissue samples were stored at -80 °C until analysis.

Biochemical analysis: To perform the analysis, the tissues were thawed by removing them from the –80°C freezer. The dissected tissue samples were homogenized in ice by adding 10 times their weight in phosphate buffer (50 mmol/L, pH 7.4). After the homogenized sample was taken in sufficient amount for TAS, TOS, MDA, PC and GSH studies, the remaining homogenate was vortexed with an equal volume of 3/5 prepared chloroform/ethanol mixture and centrifuged at 3200 rpm +4 oC for 30 minutes. Protein determination was made from the upper ethanol phase. TAS and TOS were measured with commercially available kits and results are shown as mmol Trolox equvalan/L. MDA measurement was performed using a commercial kit (Bioxytech MDA-586 Assay Kit, Oxis Research, Poland). GSH levels were determined by the enzymatic colorimetric method using commercial kits (Cat. #703002, Cayman Chemical, Ann Arbor, MI). Results are shown as µmol/mg protein. Tissue protein amount was determined according to the method of Lowry et al. (Lowry et al., 1951).

Statistical Analyzes

Obtained results are given as mean ± standard deviation. One of the nonparametric tests, Kruskal-Wallis analysis of variance test was applied. Comparisons were made using the Mann Whitney-U test for the parameters that were statistically different. Calculations were made using the Windows compatible SPSS 15.0 statistical program.

Results

The MDA levels of the heart tissue of rats fed with curcumin supplementation are shown in Figure 1. MDA levels decreased in the curcumin supplemented group compared to the control group, and there was no statistically significant difference between the two groups (1.97±0.24 and 1.81±0.48 in the K1 and D1 groups, respectively) (P>0.05).

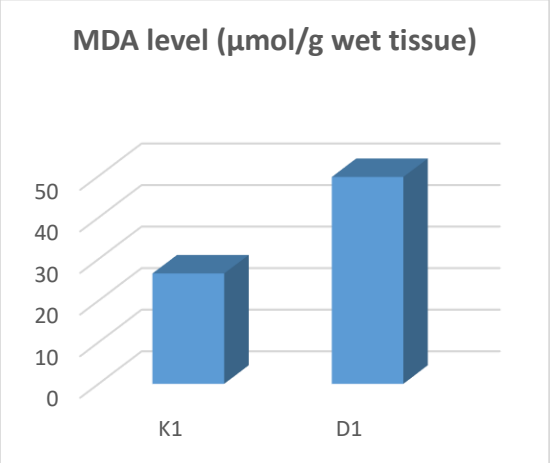

Figure 1. Effect of curcumin on MDA levels in heart tissue. K_1: Control, D_1: Curcumin

GSH levels of heart tissue of rats fed with curcumin supplement are given in Figure 2. GSH levels in the curcumin supplemented group were statistically significantly higher than the control group (28.44±6.97 and 59.76±39.88 in K1 and D1 groups, respectively) (P<0.05).

Total antioxidant capacity (TAS) values between K1 and D1 groups showed that the experimental group showed a statistically significant increase compared to the control group (1.44±6.97 and 1.56±39.88 in K1 and D1 groups, respectively) (p<0.05).).

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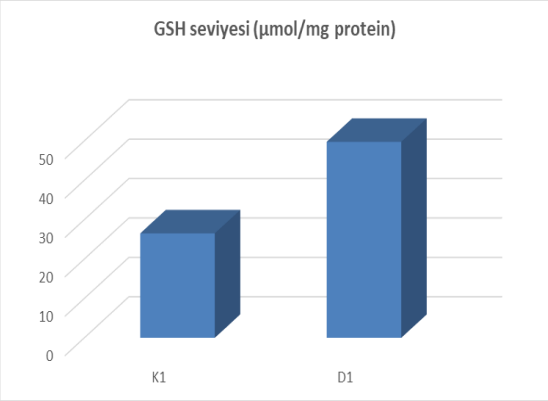

Figure 2. Effect of curcumin on GSH levels in heart tissue. K1: Control, D1: Curcumin. *KON according to P<0,05

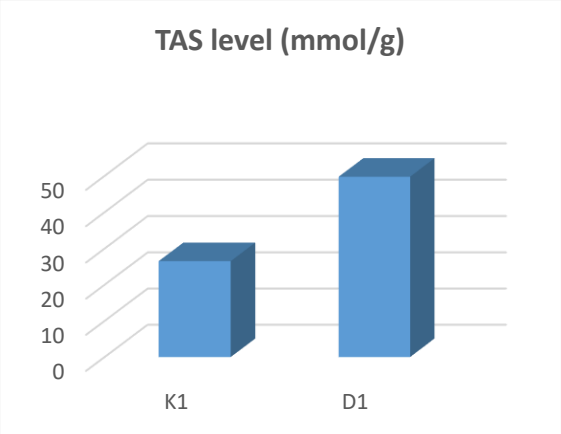

Figure 3. Effect of curcumin on TAS levels in heart tissue. K1: Control, D1: Curcumin

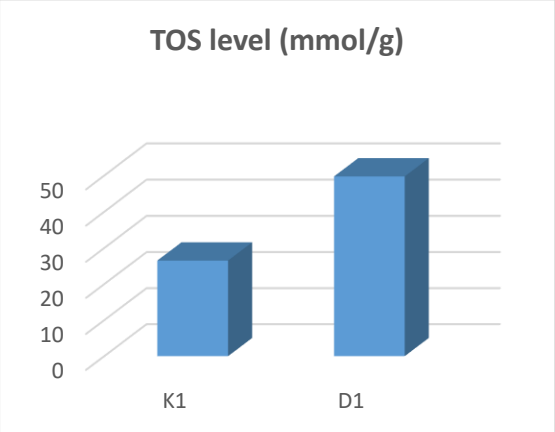

Figure 4. Effect of curcumin on MDA levels in heart tissue. K_1: Control, D_1: Curcumin

Total oxidant capacity (TOS) values between the two groups revealed that the experimental group showed a statistically significant increase compared to the control group (3.16±0.97 and 3.66±0.88 in K1 and D1 groups, respectively) ($p<0.05$).

Conclusion

The aim of this study was to investigate the effects of curcumin supplementation on oxidative stress and antioxidant defense in heart tissue in adult rats. The results revealed that 12-day curcumin supplementation reduces oxidative damage in heart tissue and strengthens the antioxidant defense system.

The heart is the only organ in our body that is in continuous operation (Nakao et al., 2000). The constant working of the heart is one of the causes of high oxygen consumption. This causes it to be exposed to more oxidative stress than other organs (Jenkins, 1993). As a result of increased oxidative stress, DNA, protein and lipid damage and a decrease in antioxidant levels occur (Parildar et al., 2008).

The protective effect of curcumin on the cardiovascular system is due to its inhibition of lipid peroxidation as a result of scavenging free radicals. It is known that it provides a cardioprotective effect on cardiac damage caused by free oxygen radicals by inhibiting free oxygen radicals. It also increases the formation of sulfhydryl groups. It also protects the heart against damage by preserving the integrity of the membrane. Studies have shown that the antioxidant effect of curcumin has a protective role on the heart and the 300 mg/kg dose applied has an antioxidant effect (Wongcharoen and Phrommintikul, 2009).

In this study, TAS and TOS levels were found to be significantly increased ($P<0.05$) in the

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curcumin given group compared to the control group, and there was no statistically significant difference between the two groups. According to this result, curcumin strengthens the antioxidant defense system and this feature is due to the phenolic component curcumin. GSH levels were higher in the group that took the curcumin supplement. GSH is an important component of the antioxidant defense system and ensures the protection of cell membrane integrity (Kakarla et al., 2005). The literature supports that increased GSH level has a cardioprotective effect (Naik et al., 2011).

Although there was no statistically significant difference between the groups ($p>0.05$), MDA levels in the curcumin given group showed a tendency to decrease compared to the control group. These data show that curcumin, which has antioxidant properties, has a protective effect on the heart (Nazam et al., 2007; Thiyagarajan and Sharma, 2004; Zhao et al., 2008).

In conclusion, our findings from this study show that 12 days of curcumin supplementation protects the heart tissue of aged female rats against oxidative damage and strengthens the antioxidant defense system. However, since there are not enough studies on this subject in the literature, more detailed studies are needed, especially considering the mechanism of action of curcumin.

Conflicts of interest

There are no conflicts of interest to declare.

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Research Article / Araştırma Makalesi

Antimicrobial Protective Effects of Essential Oil of Pickling Herb in Creams

Kremlerde Çörtük Uçucu Yağının Anitimikrobiyal Koruyucu Etkisi

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Abstract: Finding and choosing alternative herbs with strong aroma and antimicrobial properties that grow naturally in Turkey -our country- is especially important for cosmetic products. In this study, the pickling herb (*Echinophora sibthorpiana* Guss.) also known as "çörtük", "tarhana grass" among people was used. Essential oil in plants collected from their natural environment was obtained by distillation and the analysis of volatile components was performed. Then the microbial protection of essential oil in the creams was performed. The pH and viscosity measurements and rapid microbiological analyzes were made in all creams. The results revealed that it was found that no microbial activity was observed in the creams and their pH was compatible with the skin pH.

Keywords: Pickling Herb, Alpha Phellandrene, Methyl Eugenol, Essential Oil, Creams.

Öz: Ülkemizde -Türkiye'de- doğal olarak yetişen, güçlü aroma ve antimikrobiyal özelliğe sahip olan alternatif bitkilerin bulunması ve seçilmesi özellikle kozmetik ürünler açısından oldukça önemlidir. Bu çalışmada halk arasında "çörtük", "tarhana otu" olarak da bilinen *Echinophora sibthorpiana* Guss. kullanılmıştır. Doğal ortamlarından toplanan bitkilerde bulunan uçucu yağlar damıtma yoluyla elde edilmiş ve uçucu bileşenlerin analizi yapılmıştır. Daha sonra uçucu yağın kremdeki mikrobiyal koruyuculuğu çalışılmıştır. Tüm kremlerde pH ve viskozite ölçümleri ile hızlı mikrobiyolojik analizler yapılmıştır. Sonuçlar, kremlerde mikrobiyal aktivitenin gözlenmediğini ve pH'larının cilt pH'ı ile uyumlu olduğunu ortaya koymuştur

Anahtar Kelimeler: Çörtük, Alfa Phellandrene, Metil Öjenol, Uçucu Yağ, Krem.

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Introduction

The pickling herb (*Echinophora sibthorpiana* Guss.) is a member of the *Apiaceae* family. It is a 20-50 cm tall bush like green wild plant with yellow flowers, hairy leaves that can grow easily (Hosseini et al., 2017). This plant, which still waiting to be explored in every aspect, has attracted much attention due to its pharmacological properties.

The pickling herb -a plant with sharp aroma that can be noticed even from a distance and with beautiful appearance due to its yellow flowers- is highly preferred in complementary medicine since its flowers and leaves can be used separately. Its roots, leaves and stem can ve used as drug. While its essential oil (EO) is obtained by steam distillation, in dry form it is consumed as tea and spice in tarhana and pickles. Its most important pharmacological properties are antimicrobial and antifungal activity. It is reported in the literature that the pickling herb contains 0.20-0.95% or 1.3% essential oil (Özcan and Akgül, 2003). Alpha-phellandrene and methyl eugenol are defined as the major compounds in investigated essential oil (Georgiou et al., 2010; Gokbulut et al., 2013). Another important benefit it offers is that it enables those, who suffer from kidney stones or

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renal calculi, are relieved from their problems painlessly. Moreover, in food industry it is used as both as preservative (i.e., in meat) and as flavor (Sengun et al., 2018). It has good antioxidant properties and is generally said to prevent formation of painful grips in women, relaxes the muscles, if any, and relieves them (Cakilcioglu and Turkoglu, 2010). It is known as wound healer in alternative medicine and it is frequently preferred in treatment of dermal diseases such as eczema (Moghaddam et al., 2019). Its content is effective on many disorders such as respiratory and digestive disorders. Therefore, it is known as the healing herb. Its tea is a cure for asthma and bronchitis and facilitates breathing. It prevents accumulation of the infected cells that may come from the respiratory tract to the bronchi and clears the throat from infection (Ozturk et al., 2017).

The major components of the pickling herb essential oil are alpha-phellandrene and methyl eugenol. Alpha-phellandrene, a monoterpene found in the EO of various plants with analgesic and inflammatory effects and is found in high ratio in the pickling herb. Much effort is devoted to exploring its potential to be an analgesic drug (Lima et al., 2012). Moreover, it is thought that it can be used in wound healing as it reduces inflammation and oxidative stress (de Cristo Scherer et al., 2019). It has been observed that this cyclic monoterpene found in plants causes DNA damage that leads to formation of cancer cells (Lin et al., 2015). It was shown to promote natural killer cell activity as well as immunity in normal BALB/c mice (Lin et al., 2014). Methyl eugenol, is a monoterpene with sedative effect on the nervous system and is used in the perfumery and food industry. It is also known that they create a strong antimicrobial effect (Coşkun, 2006).

Humans are dynamic by nature and this pushes them to wear out with aging over time. This situation creates a motivational need for self-renewal and self-care. In modern societies, with the creation of a perception of beauty regardless of gender, cosmetics offers people the solution to this need –the healing from nature- on a gold platter. Cosmetic derives from the Latin word "cosmos" meaning beauty. In the 4th article of the Cosmetic Regulation, cosmetics is defined as "to the outer parts of the human body; All substance prepared to be applied to epiderma, nails, hair, hair, lips and external genitalia or teeth and oral mucosa, whose sole or main purpose is to clean these parts, to smell, to change their appearance, to protect them, to keep them in good condition or to correct body odors or mixtures" (The Ministry of Health, 2005). Human beings have used unique cosmetic products since their existence, and over time this has led to the rise of a new sector. Cosmetics have determined its place in the world economy depending on the demands with technological developments.

Cosmetics are a wide range of products that include many and various products used from health to hygiene, care to treatment. The content of the products has diversified according to the supply-demand situation between the consumer and the producer. Therefore, the frequency of use and the continuous opening during its consumption makes it prone to contamination. In order to prevent the growth of microorganisms that threaten the consumer health addition of protective chemicals to the products in certain proportions is standardized.

Before the chemical and microbiological standards of the product ingredients were regulated by the cosmetic law, consumers were unaware of the harms of the product they used. Romans just as the Egyptians and Romans used mercury and lead without knowing its toxic effects (İlter, 2011). Aside from the negative effects of harmful chemicals contained in the products, it is highly likely that product used would be contaminated and thus use of this would cause serious health problems later (Dao et al., 2018).

In 1946, infant deaths in New Zealand due to the use of talcum powder contaminated with *Clostridium tetani* showed how dangerous the use of contaminated cosmetic products can be (Tan and Tüysüz, 2013). Due to contamination can occur during production or use of the product, it can

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cause visible deterioration in the product. This can cause skin irritation, infection, allergies, or even permanent damage. In medical literature some cases that can lead to blindness due to bad shampoos are reported. Preservatives are chemicals added to the content of the product at sufficient levels for to prevent similar situations, to extend the shelf life of the product, to prevent the growth of microorganisms in cosmetics, and to protect the chemical structure of the product. There are limits for use of preservatives -chemicals that cause biological effects on consumers- have been legalized (The Ministry of Health, 2005). Protecting the product from contamination is of great importance. Hence, even in organic products preservatives are used at certain amounts.

Although preservatives are known to protect the product against microorganisms, it should not be ignored that these chemicals may also have negative effects. For example, paraben, which is frequently preferred and used in cosmetics, food and medicine, passes through the placenta and increases lipophilic character with its estrogenic effect and causes accumulation in adipose tissue (Sinan, 2018) and especially because of this it is thought to be associated with breast cancer.

Today, in order to prevent the above-mentioned health problem's reliability tests are applied to the products. The tests applied measure the degree of antimicrobial activity of the preservatives added to the produced preparations, their durability throughout the shelf life and production starts according to the validity status. Since the consumers are concerned about the use of preservatives used in cosmetics due to their negative health effects, consumers favor medicinal and aromatic herbs that act as natural protective shields. In this study; firstly, the pickling herb was collected from Isparta, then essential oil from the pickling herb was obtained via distilling and volatile components analysis was performed. Then, three cream samples (Control, Protective and PH EO) formulated in different ways were compared in terms of various parameters (pH, viscosity and microbiological activity).

Materials and Method

Collecting the pickling herb for distillation and obtaining essential oil

The pickling herb (*Echinophora sibthorpiana* Guss.) used in the study were collected from Isparta/Turkey. The plants were washed and cleaned. The samples were then quickly transferred to the Clevenger apparatus for to obtain EO via water-steam distillation for 2 hours. The essential oil obtained after distillation was analyzed in Gas Chromatography (GC). The temperature program for the 286 GC was as follows; 60 °C initial temperature, after waiting for 2 minutes at 60 °C to increase 220 °C with 2 °C /min, after reaching this temperature the temperature was kept constant for 20 minutes. The injection was performed in the split mode (20:1). The injection volume was 1 µL. Injector temperature was 240 °C. The GC-MS (Gas Chromatography–Mass Spectrometry) interface was heated at 240°C. MS ion source temperature was 230°C and MS-quadrupole was 150 °C. The electron impact energy was set at 70 eV, and data were collected in the range of 30500 atomic mass units (amu). Compounds' identification was based on mass spectra by comparison with MS spectral database from Wiley. The integrations were performed with MSDCHEM software (Baydar et al., 2013).

Preparation of creams

In the cream production process, which is carried out in accordance with the cosmetics legislation, thickeners, oils, emulsifiers, moisturizers and preservatives are included in the formulation together with essential oil. The oil phase and water phase of the creams were first mixed and heated up to 80 °C, then cooled to 40 °C and mixed for another 15 minutes (Şenses, 2007). Afterwards, they were passed through a homogenizer and the creams took their final shape.

Measurements/analysis of the creams

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In the study, three different creams were created. The first sample was the control and does not contain protective chemicals/PH EO, the second sample was the preservative cream and contains protective chemicals and the third sample was formulated with the EO obtained from the pickling herb and was named the PH EO. The oil phase -a cream forming phase- was obtained by incorporating the EO obtained from the pickling herb in the formulation and to form a new moisturizing cream. Three repetitive (one-month interval) measurements and analysis studies were carried out with in all creams. The pH of the creams was measured by Mettler Toledo brand and S20K KIT model pH meter. Viscosity studies were performed with Brookfield brand, RVDV-11 + PX model viscometer (Erbil, 2000). Microbiological analyses were performed with Biomerux brand Tempo. All analyzes and measurements were carried out at the Burdur Mehmet Akif Ersoy University Application and Research Center.

Statistical analysis

Each experiment was repeated at least three times per sample. Values are expressed as the means ± SD. For all experiments, the overall data were statistically analyzed in SPSS version 25.0 (IBM-SPSS Inc. USA). Duncan's multiple range tests were used ($p < 0.05$).

Results

The results of the measurements and analysis of cream samples were presented below.

Volatile components analysis in GC-MS

The chemical composition of the pickling herb essential oil was summarized in Table 1. Fifteen components were characterized representing 99.9% of the total oil. The oil was characterized by the occurrence of monoterpenes with alpha-phellandrene (28.8%) being the dominant component (Georgiou et al., 2010). The phenylpropanoid derivative methyl eugenol was also found in the oil with a high percentage (24%).

Table 1. Chemical Composition of the Essential Oil of the Pickling Herb

The Components	Retention Time (RT)	Rate %
alpha-thujone	5.08	1.0
alpha pinene	5.2	1.7
camphene	5.4	0.1
sabinene	5.8	0.5
2-beta pinene	5.9	0.3
beta myrcene	6.1	2.1
alpha-phellandrene	6.4	28.8
delta 3-carene	6.5	19.5
gamma terpinene	6.6	2.7
p-cymene	6.7	3.3
beta-phellandrene	6.8	12.9
gamma terpinene	7.3	1.5
alpha-terpinolene	7.8	1.4
1,5,8-p-menthatriene	8.2	0.1
methyl eugenol	12.7	24.0
TOTAL		**99,90**

pH Measurement

The pH values of the creams were measured at 1-month intervals (30th, 60th and 90th days) from their production. The statistically evaluated results are given in the table (Table 2).

Viscosity measurements

Viscosity - a measure of the resistance of a fluid to deformation under surface tension- can be defined as the internal resistance of the fluid against flow. The viscosity results show that while the viscosity results of the first and second sample do not differ greatly, the viscosity was observed to decrease in the third sample -the cream formulated with the EO obtained from the pickling herb. Viscosity measurements were carried out at different rpm (revolution per minute) values (10-100 rpm) and the results are given in Table 3. The viscosity results of the prepared creams are given in Table 3. The results revealed that control sample was determined as 32200-3120 mPa.s. Protective sample and PH EO were found as 31150-2900 mPa.s and 28634-2160 mPa.s, respectively.

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Table 2. The pH Measurements of Creams

Creams	1.pH (30th day)	2. pH (60th day)	3.pH (90th day)
Control	*5.23 ± 0.02[a]	5.36 ± 0.03[c]	5.40 ± 0.01[a]
Protective	5.52 ± 0.01[b]	5.43 ± 0.02[b]	5.49 ± 0.02[b]
PH EO	5.56 ± 0.01[c]	5.30 ± 0.02[a]	5.37 ± 0.02[a]

*Shows values with insignificant difference ($p<0.05$) for each column shown with same letters (± standart deviation)

Table 3. The Viscosity Measurements of Creams

Creams	Viscosity (mPa.s)									
	10 (rpm)	20 (rpm)	30 (rpm)	40 (rpm)	50 (rpm)	60 (rpm)	70 (rpm)	80 (rpm)	90 (rpm)	100 (rpm)
Control	*32200±275[b]	16200±494[b]	11800±659[c]	8500±459[b]	6730±260[b]	5650±258[b]	4750±245[b]	4250±490[b]	3555±430[b]	3120±258[b]
Protective	31150±752[b]	15800±353[b]	10089±549[b]	7845±755[b]	6633±624[b]	5245±430[b]	4605±310[b]	4100±304[b]	3250±354[ab]	2900±324[b]
PH EO	28634±760[a]	12264±370[a]	8200±195[a]	6500±225[a]	4980±180[a]	3544±145[a]	3150±359[a]	2879±230[a]	2656±220[a]	2160±157[a]

*Shows values with insignificant difference ($p<0.05$) for each column shown with same letters (± standart deviation)

Table 4. The Results of the Microbiological Studies

Creams	Total Mesophilic Aerobic Bacteria Count	*E. coli*	Analysis Method
Control	<10 CFB/g	<10 KOB/g	TEMPO, Instrument procedural handbook
Protective	<10 CFB/g	<10 KOB/g	TEMPO, Instrument procedural handbook
PH EO	<10 CFB/g	<10 KOB/g	TEMPO, Instrument procedural handbook

Microbiological studies

The results of the rapid microbiological analysis performed in three replicates with a one-month intervals were presented below. At the end of the 90 days period, no contamination (Total Mesophilic Aerob Bacteria and *E. coli*) above the limit value was observed in any of the creams.

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Discussions

In this study, firstly the pickling herb was collected and distilled via hydrodistilled. Then the volatile components analysis was performed. The creams were formulated with pickling herb essential oil, thickeners, oils, emulsifiers, moisturizers and preservatives. pH, viscosity measurements were made for 90 days (three repetitive and one-month intervals). The protective effect of pickling herb essential oil in creams was studied by rapid microbial tests.

Georgiou et al. (2010) reported that, alpha-phellandrene (43.8%) and methyl eujanol (28.6%) were the major components in pickling herb's essential oil. This study supports our findings. However, the percentage rates were found to be lower than results of Georgiou and colleagues. It is thought that this is related to the location where the plant was collected and the harvesting period of the plant, or it may be due to a different chemotype.

The pH of the skin is acidic (pH=4-6) (Proksch, 2018). Therefore, all cream samples were in the desired pH range. The results of a 90-day this study showed that all three cream samples were found to be derma-friendly creams that comply with the standards.

The Brookfield viscometer has limited sensitivity. Measurements should be made with the same spindle at constant temperature and constant rotation speed (Bovey, 1965; Erbil, 2000). The measurements were carried out with the same spindle at constant temperature in this study. The viscosity of the *control* (32200-3120 mPa.s) and *protective* (31150-2900 mPa.s) sample were similar to each other, while the viscosity of *PH EO* cream was measured lower as 28634-2160 mPa.s. It is estimated that the viscosity decreases due to the fluidity of the essential oil (Kwak, 2015). Consequently, 90 days viscosity values show that all three creams are in spreadable fluidity

As a result of the rapid microbiological analysis, no contamination above the limit value (Total Mesophilic Aerobic Bacteria and *E. coli*) was found in any of the creams. 90 days may not have been enough to detect microbial contamination.

Conclusion

These results show that all creams, including the control, were safe at the end of 90 days, a spreadable consistency and compatible with the skin. However, 90 days dose not enough time to understand product safety. According to the legislation, longer-term stability and challenge tests are needed. It was expected that this study will be informative for future studies and contribute to the literature.

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Ethics Approval

Ethical approval is not required.

Conflict of Interest

The author declare that they have no conflict of interests.

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Research Article / Araştırma Makalesi

Influence of Milk Fat on Listeria monocytogenes Viability Under Simulated Gastrointestinal Conditions and on the Viable But Not Countable State

Simule Edilmiş Gastrointestinal Koşullar Altında Süt Yağının Listeria monocytogenes Canlılığına ve Canlı Ancak Sayılmayan Durumu Üzerine Etkisi

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Abstract: Along with the high nutritional value, milk represents an excellent medium for the growth of certain microorganisms, some of which can be life threatening. Milk fat has been found to affect the survival of *L. monocytogenes* in milk. The present study aimed to evaluate the effect of milk fat in the survival of *L. monocytogenes* in milk under simulated gastrointestinal conditions. Four compartments (saliva, gastric, small intestine and large intestine) mimicking the human physiological conditions were established to evaluate the viability of *L. monocytogenes* inoculated in milk. Given that milk is generally consumed as a breakfast meal, the evaluation was done in the fasted state of the gastrointestinal system. A decrease to 5 $\log_{10}$ CFU/ mL was determined in saliva compartment, in the evaluation after 48 h of cold storage. In the viable but not countable evaluation, *L. monocytogenes* counts were determined to be 8 $\log_{10}$ CFU/ mL for skim milk and semi-skim milk, and 9 $\log_{10}$ CFU/ mL for whole fat milk in the saliva compartment. Regardless the fat content, *L. monocytogenes* was not detected in any of the milk groups in the lower parts of the simulated gastrointestinal compartments.

Keywords: *Listeria monocytogenes*, Milk, Milk Fat, Simulated Gastrointestinal System.

Öz: Süt, yüksek besin değeriyle birlikte, yaşamı tehdit edebilen belirli mikroorganizmaların büyümesi için de mükemmel bir ortamdır. Süt yağının, sütte bulunan *L. monocytogenes*'in canlılığına etki ettiği görülmüştür. Bu çalışmada, simüle edilmiş gastrointestinal koşullar altında sütte *L. monocytogenes*'in hayatta kalmasında süt yağının etkisinin değerlendirilmesi amaçlanmıştır. Süte aşılanan *L. monocytogenes*'in canlılığını değerlendirmek için insan fizyolojik koşullarını taklit eden dört farklı ortam (saliva, mide, ince bağırsak ve kalın bağırsak) oluşturulmuştur. Sütün genellikle kahvaltı öğünü olarak tüketildiği göz önüne alındığında, değerlendirme gastrointestinal sistemin aç olduğu durumda yapılmıştır. 48 saat soğukta saklama sonrası yapılan değerlendirmede saliva ortamında 5 $\log_{10}$ CFU/ mL'ye kadar düşüş tespit edilmiştir. Canlı ancak sayılamayan değerlendirmede saliva ortamında *L. monocytogenes* sayısı yağsız ve yarım yağlı süt için 8 $\log_{10}$ CFU/ mL, tam yağlı süt için 9 $\log_{10}$ CFU/ mL olarak belirlenmiştir. Simüle edilmiş gastrointestinal ortamların alt kısımlarında incelenen farklı yağ içeriğine sahip olan süt gruplarında *ise L. monocytogenes* tespit edilmemiştir.

Anahtar Kelimeler: *Listeria monocytogenes*, Süt, Süt Yağı, Simüle Edilmiş Gastrointestinal Sistem.

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Introduction

Milk and dairy products represent an important fraction of the human diet, providing a supply of proteins, vitamins, and minerals (Bianchi et al., 2013; Huth et al., 2006). There is a wide range of dairy accessible, the majority of which is produced from pasteurized milk. Although, a rising consumer demand for raw milk is present alongside this developed market (Latorre et al., 2009). In addition to their rich composition (Bianchi et al., 2013) dairy products can support the growth of various foodborne pathogens, such as *Listeria monocytogenes* (Arqués et al., 2015; Lee et al., 2019).

L. monocytogenes is a ubiquitous pathogen that is able to remain its viability even under unfavourable conditions such as refrigeration temperatures, high salt concentration and low pH (Dalzini et al., 2016). Despite that mortality rate from listeriosis is between 20 and 30%, categories such as new-borns, pregnant women, immunocompromised individuals, or the elderly, may anticipate far worse outcomes (Eicher et al., 2020; Erol and Taşçı, 2021). Due to its psychrophilic properties, even very low counts can result in an increase of the population of *L. monocytogenes* in the milk stored in refrigeration temperatures (Mortazavi and Aliakbarlu, 2019). Because contaminated milk can be consumed directly or used to make dairy products, there is an ongoing need to develop ways for managing and monitoring *L. monocytogenes* (Chen and Zhong, 2017). The presence of *L. monocytogenes* in milk as a result of pasteurization defects or post-pasteurization contamination remains a point of concern (Lee et al., 2019). It has been determined that fat plays a pivotal role in the protection of *L. monocytogenes* from thermal damage (Verheyen et al., 2020, Özkale and Kahraman, 2022). *L. monocytogenes*, under adverse conditions, is be able to enter a "viable but non-culturable" (VBNC) form, which might help it propagate up the food chain (de Medeiros Barbosa et al., 2020; Overney et al., 2017).

To the knowledge of authors, no studies have been conducted to evaluate the effect of milk fat on the viability of *L. monocytogenes* in different compartments of the simulated gastrointestinal system simultaneously. The present research aimed to evaluate the effect of the milk fat in the viability of *L. monocytogenes* in the vegetative and viable but not countable state under simulated gastrointestinal conditions.

Material and Method

The UHT milk used in the study was purchased commercially. The viability of *L. monocytogenes* was evaluated using standardized skimmed (0.1%), semi-skimmed (1.5%), and full-fat milk (3%).

L. monocytogenes Isolation

Isolation of *L. monocytogenes* from milk (presence/absence test) was performed according to EN ISO 11290-1:2017 standard. Milk samples were plated onto ALOA (*Merck,1.00427.0500*) supplemented with 2 supplements (*Merck, 100432 and Merck, 100439*) and incubated at 37 °C for 48 h prior to inoculation. Blue/ green colonies surrounded by a halo were evaluated as *L. monocytogenes*.

Preparation of the Bacterial Inoculum

L. monocytogenes (ATCC 13932, serovar 4b) was initially inoculated into 10 mL of Tryptic soy broth (*Merck, Millipore*) and incubated for 24 hours at 30 ºC. After incubation, the pellet was centrifuged at 4200 rpm for 5 minutes (*Eppendorf Centrifuge 5810 R*). Afterwards, the supernatant was removed and 10 mL of 0.9% sterile physiological saline was added to the pellets. This centrifugation process was repeated twice. The pathogen concentration was adjusted to 10^9 CFU/ mL and confirmed by microbiological cultivation.

Sample Preparation

A total of six UHT milk samples were acquired from a local market in 200 mL aseptic tetra pack containers. The whole fat milk (WFM), semi-

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skimmed (SSM) and skimmed (SM) UHT milk were maintained at +4 °C until the trials were performed. *L. monocytogenes* was inoculated at a concentration of 10^9 CFU/mL. After each inoculation of the stock samples, by spreading the dilutions on plates, the final concentration of *L. monocytogenes* cells in each milk sample was found to be around 10^7 CFU/mL. The inoculated stock samples were stored at +4 °C and analysed on the 24 and 48th day.

Establishment of the in vitro System

A simulated gastrointestinal system was established to evaluate the survival of *L. monocytogenes* in three types of milk. Four consecutive compartments, each mimicking the saliva, gastric fluid, small and large intestines in a fasting state, were prepared according to the method described by Rugji and Dinçoğlu, (2022). Parameters such as transition time, pH and overall temperature of each compartment were selected based on physiological conditions of healthy individuals (Prezzi et al., 2020).

Evaluation of *L. monocytogenes* in UHT Milk to Determine Viability in the Simulated Gastrointestinal Tract

Initially, 1 mL of each milk sample was individually transferred to saliva compartment (10 mL) and incubated at 37 °C for 5 min/ 50 rpm. At the end of the incubation, respective samples were manually transferred to the other compartments and incubated 2 h in the gastric fluid, 2 h in the small intestine compartment and 2 h in the large intestine compartment at 37 °C/50 rpm. At the termination of incubation for each compartment 1 mL was sampled from each compartment. Samples were serially diluted and respective dilutions were pour-plated on ALOA (EN ISO 11290-2:2017). To determine the VBN counts, parallelly samples were pour plated on ALOA-Nutrient agar (NA) medium using thin agar layer (TAL) method as described by Evert-Arriagada et al. (2018) with minor modifications. The purposely inoculated milk samples were preserved at +4 °C. The same procedures were repeated 24 and 48 hours later.

Statistical Evaluation

The effect of the fat on the viability of *L. monocytogenes* under simulated gastrointestinal conditions were determined by analysis of variance (ANOVA), followed by Tukey test. The factors were fat and simulated gastrointestinal compartments: skimmed (group A), semi-skimmed (group B), and full-fat milk (group C). All determinations were carried out in triple. The data are evidenced as the mean ± standard deviation.

Results

Table 1 exhibits *L. monocytogenes* counts in three different fat level milk groups during a 48-h evaluation under simulated gastrointestinal conditions. The counts in all groups were determined at a 6-log level. In the initial evaluation, no differences were observed between groups in terms of bacterial counts in the simulated saliva fluid. *L. monocytogenes* was not detected in the lower parts of the simulated gastrointestinal fluid in the initial evaluation. In the following evaluation (24 and 48 h later) a decrease in *L. monocytogenes* counts was determined (Fig. 1). For both evaluations counts were determined at a 5-log level at the saliva fluid. Similar to the initial evaluation, *L. monocytogenes* counts were not detected in the lower parts of the simulated gastrointestinal fluid.

Table 2 displays *L. monocytogenes* viable but not countable counts in three different fat level milk groups during a 48-h evaluation under simulated gastrointestinal conditions. The results of the initial evaluation (0-h) are similar to the results obtained from the standard count evaluation in the saliva fluid (6-log for all groups). An increase in *L. monocytogenes* counts was determined in the following determinations. For both evaluations, *L. monocytogenes* counts were determined to be 8-log for skim milk and semi-skim milk, and 9-log for whole fat milk (Fig. 2). *L. monocytogenes* was not

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detected in the lower parts of the simulated gastrointestinal fluids in any of the evaluation days.

Table 1. The survival of *Listeria monocytogenes* in milk samples under simulated gastrointestinal system on ALOA agar (log_{10} CFU/mL)

	0 h			24 h			48 h		
	SM	**SSM**	**WFM**	**SM**	**SSM**	**WFM**	**SM**	**SSM**	**WFM**
SF	6.0±0.01	6.0±0.01	6.0±0.01	5.0±0.01	5.0±0.01	5.0±0.01	5.0±0.01	5.0±0.01	5.0±0.01
GF	ND	ND	ND	ND	ND	ND	ND	ND	ND
SIF	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIF	ND	ND	ND	ND	ND	ND	ND	ND	ND

SF- Saliva fluid, GF- gastric fluid, SIF- small intestine fluid, LIF- large intestine fluid
SM- Skimmed milk, SSM- semi skimmed milk, WFM- whole fat milk
A-B Differences between groups with different superscripts in the same line are important (P<0.05)
ND- Not Detected (< 1 log_{10} CFU/g)

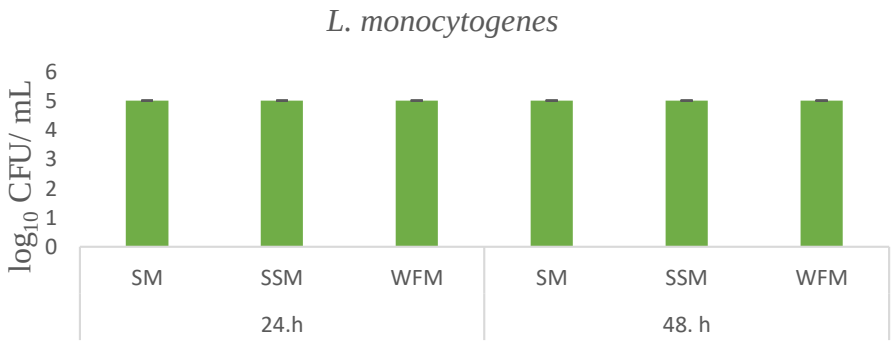

Figure 1. Evaluation of *L. monocytogenes* on saliva fluid

Discussion

L. monocytogenes is a ubiquitous microorganism well-known for its resistance to adverse ambient factors such as low pH. The acid tolerance response (ATR) of *L. monocytogenes* is thought to be critical for its survival, resulting in the pathogen's persistence in food-processing conditions. Temperature and pH are major triggers of the ATR state of *L. monocytogenes*. The pH range that triggers *L. monocytogenes* ATR is 4.5-6.0 at 30 °C or 37 °C (Liu et al., 2020). Considering these properties, Listeriosis an important concern in terms of food safety (Lee et al., 2019). Due to its high nutritional value, pH balance, and high-water activity, milk is an ideal growing habitat for a variety of bacteria (Bando et al., 2009; Geigl et al., 2008; Lee et al., 2019). The use of heat treatments such as pasteurization and sterilization has lowered the occurrence of milk-borne illnesses (Headrick et al., 1998; Martin et al., 1997). Nonetheless, the rising trend of raw milk

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consumption necessitates the monitoring of microbiological health hazards associated with raw milk consumption (Claeys et al., 2013; Perkiomäki et al., 2012; Castro et al., 2017). The current investigation outline that *L. monocytogenes* counts were higher in the WFM sample in ALOA-NA medium after 24 hours of inoculation. A similar trend was determined in the evaluation after 48h in ALOA-NA medium. Thin agar layer method is utilized to determine the counts of bacteria that may be damaged or in the sublethal form (Evert-Arrigada et al., 2018). The TAL technique has been established in 1998 for the enumeration of heat-damaged foodborne pathogens by Kang and Fung. In this technique, a nonselective medium is added to a pathogen-specific selective medium that has already been pre-poured (Wu et al., 2001). As the fat content in milk increased, so did the viability of *L. monocytogenes*. Similar to the present study, Özkale and Kahraman, (2022) evaluated the effect of the milk fat in the viability of *L. monocytogenes* during ohmic treatment. It was determined that the increased fat content had an important inhibitory effect on the pathogen inactivation. Studies on various food matrices have been conducted to evaluate the resistance of *L. monocytogenes* under simulated gastrointestinal conditions. Vieira et al. (2019) assessed the outcome of edible coating with essential oils on apples on the survival of *L. monocytogenes*. Contrary to the present research, the exposure to saliva, gastric and gut fluid caused a significant reduction in the bacterial counts. Dong et al. (2020) determined a decrease in *L. monocytogenes* counts inoculated in cabbage exposed to simulated gastrointestinal system. Akritidou et al. (2022) evaluated the effect of gastric pH and bile acids on the survival of *Listeria monocytogenes* during simulated gastrointestinal digestion. It was determined that *L. monocytogenes* presented high gastric acid tolerance, but increased bile sensitivity during in vitro digestion. When exposed to stressful factors such as cleaning and sanitation and lack of nutrients, some pathogens transit to a metabolic state known as viable but not culturable (Kumar et al., 2019; Zhao et al., 2017). Noll et al. (2020) investigated the ability of benzalkonium chloride effect on the VBNC state of *L. monocytogenes*. Similarly, Truchado et al. (2021) determined that peroxyacetic acid and chlorine dioxide unlike chlorine induce the VBNC stage of *Listeria monocytogenes*. The presence of various disinfectants and acidic conditions, chlorine, electrolyzed water have been found to induce the VBNC state of *L. monocytogenes* (Afari et al., 2019; Arvaniti et al., 2021; Highmore et al., 2018).

Table 2. The survival of *Listeria monocytogenes* in milk samples under simulated gastrointestinal system on ALOA-NA (log_{10} CFU/mL)

	0 h			**24 h**			**48 h**		
	SM	**SSM**	**WFM**	**SM**	**SSM**	**WFM**	**SM**	**SSM**	**WFM**
SF	6.0±0.01	6.0±0.01	6.0±0.01	8.0±0.01B	8.0±0.01B	9.0±0.01A	8.0±0.01B	8.0±0.01B	9.0±0.01A
GF	ND	ND	ND	ND	ND	ND	ND	ND	ND
SIF	ND	ND	ND	ND	ND	ND	ND	ND	ND
LIF	ND	ND	ND	ND	ND	ND	ND	ND	ND

SF- Saliva fluid, GF- gastric fluid, SIF- small intestine fluid, LIF- large intestine fluid
SM- Skimmed milk, SSM- semi skimmed milk, WFM- whole fat milk
A-B Differences between groups with different superscripts in the same line are important ($P<0.05$)
ND- Not Detected (< 1 log_{10} CFU/g)

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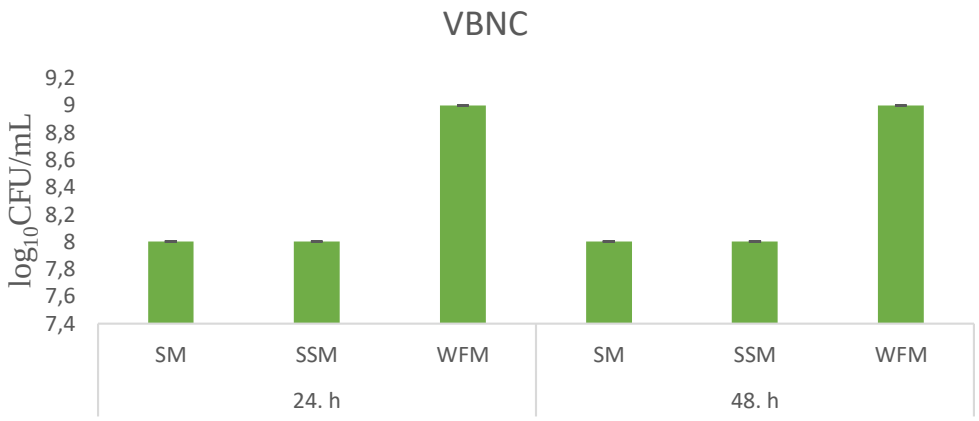

Figure 2. Evaluation of VBNC state of *L. monocytogenes* on saliva fluid

Despite its well-known adaptability and resistance toward low acidity, in the present research *L. monocytogenes* was not detected in the simulated gastric fluid. In the same manner counts were not detected in the simulated small and large intestinal fluids. Authors claim that the lack of detection of *L. monocytogenes* in the aforementioned sections may be associated with several factors including the degree of sublethal injury caused by the pH shock, lack of techniques to recover viable cells from the samples, lack in the sensitivity of the method used for detection or low inoculation levels. In light of this, investigations to a greater extent need to be done to evaluate the activity of *L. monocytogenes* toward different ambient stressor.

Conclusion

Due to its rich constitution, milk is regarded as one of the most comprehensive providers of nutrients. However, raw milk also fosters the growth of a number of potentially dangerous microorganisms. *L. monocytogenes* due to its ability to preserve the viability under adverse conditions, viable but not countable state and occurrence in the post-pasteurization contamination represents an important pathogen in terms of public health. The rise in consumption of minimally processed products has led to an increase in the consumption of raw milk. Parallelly to this trend, increases the need for proper monitoring of health hazards related to raw milk consumption. The present study revealed that the milk fat had a protective effect in the viability of *L. monocytogenes*.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper**.**

Authorship Contributions

During the study's preparation, all authors contributed equally.

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Research Article / Araştırma Makalesi

Relationship Between Cognitive and Motor Functions and Dual-task Performance in Community Dwelling Older Adults: Gender Differences

Toplumda Yaşayan Yaşlılarda Kognitif ve Motor Fonksiyonlar ile İkili Görev Performansı Arasındaki İlişki: Cinsiyet Farklılıkları

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Abstract: Dual-task performances may be impaired with the impairment in motor performance and cognitive functions due to aging. The aim of the present cross-sectional study is to investigate the gender differences in dual-task performance. A total of 82 community-dwelling older adults (41 males and 41 females) aged between 65 and 75 years were included. Motor performance was evaluated with the sit-to-stand test, the timed up and go test, 10 m walking test and cognitive functions were evaluated with Montreal Cognitive Assessment Test. Dual-task performances were evaluated as motor-motor and cognitive-motor performance. Mean age was 70.12±3.18 years for females and 69.80±3.21 years for males. Both groups were similar with regard to age, education status, exercise habits, and working status. In dual-task performances, females were found to complete motor-motor tasks in a shorter time as compared to males (p=0.001). Cognitive-motor task performances were found to be better in males (p=0.038). It is considered that gender differences in dual-task performances could be understood better in the light of the results of the present study and treatment may be arranged in accordance with these gender differences.

Keywords: Geriatric, Dual-Task, Cognition, Motor Performance, Gender Differences.

Öz: Yaşlanmaya bağlı olarak motor performans ve bilişsel işlevlerdeki bozulma ile ikili görev performansları bozulabilir. Bu çalışmanın amacı, ikili görev performansındaki cinsiyet farklılıklarını araştırmaktır. Çalışmaya 65-75 yaş arası toplumda yaşayan toplam 82yaşlı yetişkin (41 erkek ve 41 kadın) dahil edildi. Motor performans otur-kalk testi, zamanlı kalk ve yürü testi, 10 m yürüme testi ile değerlendirildi ve bilişsel işlevler Montreal Bilişsel Değerlendirme Testi ile değerlendirildi. İkili görev performansları motor-motor ve bilişsel-motor performans olarak değerlendirildi. Ortalama yaş kadınlarda 70,12±3,18 yıl, erkeklerde 69,80±3,21 yıl idi. Her iki grup yaş, eğitim durumu, egzersiz alışkanlıkları ve çalışma durumu açısından benzerdi. İkili görev performanslarında ise kadınların motor-motor görevleri erkeklere göre daha kısa sürede tamamladıkları görüldü (p=0,001). Bilişsel-motor görev performansları erkeklerde daha iyi bulundu (p=0,038). Bu çalışmanın sonuçları ışığında ikili görev performanslarındaki cinsiyet farklılıklarının daha iyi anlaşılabileceği ve bu cinsiyet farklılıklarına göre uygulanacak tedavinin düzenlenebileceği düşünülmektedir.

Anahtar Kelimeler: Yaşlı, İkili Görev, Kognisyon, Motor Performans, Cinsiyet Farkları.

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Introduction

Double/multiple/dual task is a neuro-physiologic process that requires performing two tasks concurrently. Performing more than one task concurrently is a process that we encounter frequently in daily living (Springer et al., 2006). Postural control is defined as the response to vestibular, visual and proprioceptive information resulting from movement-related conceptual process. Many automatic activities like crossing a crowded road, talking on the phone while walking and shopping in a market require a very good postural control and attention (Dubost et al., 2006).

Many complex and unexpected conditions should be overcome for maintenance of mobility and postural control in daily living. So, sharing the attention to two or more tasks is frequently done in daily living (Swanenburg et al., 2008). In community dwelling older adults, the problems like impaired postural control and slowed down mental processes lead multiple task performances to be affected, also stability problems and consequently falls (Kelly et al., 2012; O'Shea et al., 2002; Plotnik et al., 2011).

In community dwelling older adults, more than 50% of falls occur during walk. Falls-related deaths are 49% more in males than in females. Recognizing gender differences in falls is important for the prevention of falls. (CDC, 2006).

When the studies investigating dual task performances were analyzed, while studies were found to investigate gender differences in dual tasks, direction finding strategies, object-place memory, learning and producing language, and even lateralization of cerebral hemisphere organization, very few studies were encountered investigating gender differences in dual tasks (Hollman et al., 2011).

As dual or multiple tasks accompany a great proportion of daily living activities, the present study was conducted with the aim of investigating multiple task performances in community dwelling healthy older adults, making a comparison of gender differences and investigating the influences of motor and cognitive tasks on dual tasks.

Materials and Methods

Study Design and Sample Size

Community dwelling healthy older adults aged between 65 and 75 years who met inclusion criteria and who were volunteer for participation were included in the study. This study was performed in line with the principles of the Declaration of Helsinki. All participants were informed about the study prior to the study and written informed consent was obtained.

Ethics Considerations

This study was approved by Non-interventional Clinical Research Medical Ethics Committee of Pamukkale University (Approval number: 60116787-020/77265). The study was registered at Clinical Trials.gov (ID: NCT04877600; URL: www.clinicaltrials.gov). As a result of the power analysis, it was calculated that when 82 individuals are taken into the study 90% power with 95% confidence would be obtained (Hollman et al., 2011).

Participants

The total of 82 older adults (41 males and 41 females) aged between 65 and 75 years were included in the study.

The individuals aged between 65 and 75 years, who agreed for participation, who received 8 or higher points from Hodkinson Mental test, who had no neurologic/orthopedic problems that could affect balance and walking, or communication problem were included in the study. The individuals who were using 3 or more medications that could affect motor and cognitive functions and the ones who could not complete the tests were excluded.

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Assessment Methods

Demographic characteristics, hobbies, exercising habits of the subjects, medications used and results of Hodkinson Mental Test were recorded to the socio-demographic information form.

Hodkinson Mental Test (HMT): HMT is a test that is used for assessment of memory and orientation in the elderly. Each correct answer is scored with 1 in the 10-question form. Scores of 6 and above indicates normal functions, 4-6 moderate impairment, 0-3 severe impairment (Hodkinson, 1972). The subjects who received 8 or higher scores were included in the study.

Assessment of cognitive functions: It was done by using Montreal Cognitive Assessment Scale (MoCA). The scale was developed as a fast-screening test for mild cognitive disorder. The test evaluates 8 different cognitive functions including attention and concentration, executive functions, memory, language, visual structural skills, abstract thinking, calculation and orientation. The possible maximum score is 30. The scores 21 and above are considered as normal (Nasreddine et al., 2005).

Assessment of physical performance:

- *Timed up and go (TUG) test* is a test which evaluates falls risk and mobility in community dwelling older adults. A chair and a chronometer are required for the test. The test is performed with the shoes that the patient always uses and he/she is stated to be allowed to use walking aids if he / she needs it. An area of 3 meters is determined in front of the chair. The individual is asked to get up from the chair, walk this distance and sit again. Elapsed time is recorded in seconds. The test's being completed in longer than 12 seconds indicates falls risk (Podsiadlo and Richardson, 1991).

- *30 seconds sit-to-stand test* is a test that evaluates sit-and-stand activity, lower extremity strength and dynamic balance. A seat height of about 44 cm and no recline, and a chronometer is needed. It is recommended to lean against the wall to prevent the chair from moving while sitting and standing. The feet should touch the ground when the subject sits, he/she sits on the chair and touches his/her shoulders with the arms crossed. The subject stands up completely upright and sits down on the chair again. The number of sitting and running in 30 seconds gives the result of the test. Sitting and standing for less than 10 in 30 seconds indicates lower extremity weakness (Jones et al., 1999).

- *10-meter walking test* is used for evaluating walking speed. The subject is asked to walk 10 m distance with his/her usual velocity (he/she uses his/her walking aid if using already). The time is started when the feet are on the start line and terminated when passes finish line. Two measurements are done and the better value is recorded as meter/second (m/s) (Wolf et al., 1999).

Assessment of dual task performance

In order to evaluate the durations of individuals' motor-motor performances in dual tasks, during the 10-meter walking test, 2 glasses were carried on a tray. In order to evaluate the duration of cognitive-motor performances, the tasks of counting the days of the week beginning from Sunday were given during the 10-meter walking test and the time to complete the tasks was recorded in seconds (Weightmann and McCulloch, 2014).

Dual task performances were estimated by using the formula: Dual task walking-Single task walking/Single task walking) x100 separately for motor and cognitive tasks (Weightmann and McCulloch, 2014).

Statistical analyses

The sample size was calculated using GPower 3.1.9.2 package program (Faul et al., 2007). Effect size obtained from the reference study was seen to be medium (d=0.56) (Hollman et al., 2011). Assuming that an effect size at this level can be achieved, as a result of the power analysis, it was estimated that 90% power would be obtained with

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95% confidence when 82 individuals (41 males and 41 females) were included in the study.

Data were analyzed by using SPSS 25.0 package program. Continuous variables were given as mean ±standard deviation and categorical variables were given as number and percent. As parametric test assumptions were provided, independent samples t test was used for comparison of independent groups and Pearson correlation analysis was used for detecting the correlations between variables. A p level of <0.05 was accepted as statistically significant (Sumbuloglu and Sumbuloglu, 2004).

Table 1. Demographic characteristics of the participants

Variables	Female (n=41) Mean±SD *or* n(%)	Male (n=41) Mean±SD *or* n(%)	*p*-value
Age (years)	70.12±3.18	69.80±3.21	0.655[a]
Body Mass Index (kg/m²)	26.41±2.29	25.94±3.29	0.445[a]
Education status			
Illiterated	1(2.4)	3(7.3)	0.259[b]
Literated	7(17.1)	11(26.8)	
Primary school	21(51.2)	16(39.0)	
Secondary school	10(24.4)	6(14.7)	
High school	2(4.9)	5(12.2)	
Exercise habits			
Yes / No	10(24.4) / 31(75.6)	9(22.0) / 32(78)	0.794[b]
Working status			
Yes / No	0(0) / 41(100)	2(4.9) / 39(95.1)	0.152[b]

a:Independent Samples t Test, b:Chi-square test, SD:Standard deviation, kg:kilogram, m:meter, Significance level: p<0.05.

Table 2. Comparison of cognitive performance and motor performances in single task

Variables	Female (n=41) Mean±SD	Male (n=41) Mean±SD	t	*p*-value
Cognitive Performance				
Montreal Cognitive Assessment	21.46±2.88	21.85±3.14	-0.58	0.560
Motor Performance				
30 second sit to stand test (repetition)	10.68±1.43	10.20±2.01	1.26	0.211
Timed up and go test (sec)	9.23±1.25	9.57±0.69	-1.53	0.130
10-meter walk test (sec)	9.90±1.04	10.28±1.64	-1.24	0.216

t: Independent Samples t Test, SD: Standard deviation, sec: second, Significance level: p<0.05.

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Results

Mean age was 70.12±3.18 years for females and 69.80±3.21 years for males. Of the females, 21 (51.2%) were graduates of elementary school, 10 (24.4%) were graduates of secondary school and 7 (17.1%) were literate. Of the males, 16 (39%) were graduates of elementary school, 11 (26.8%) were literate and 6 (14.7%) were graduates of secondary school. While no women were working, 39 (95.1%) males were not working actively. Groups were similar with regard to education status, exercising habits and working status ($p>0.05$) (Table 1).

No significant difference was found between males and females with regard to motor performance including cognitive performance ($p=0.560$) and sit-to-stand test ($p=0.130$), timed up and go test ($p=0.211$) and 10 m walking test ($p=0.216$) (Table 2).

The time for completing motor-motor dual tasks was 10.71±1.86 s in females and 11.82±1.10 s in males. Females were found to complete the test in a shorter time ($t=-3.29$, $p=0.001$). The time for completing cognitive-motor dual tasks was 12.73±1.06 s in females and 13.02±1.07 s in males. Males were found to complete the test in a shorter time ($t=2.10$, $p=0.038$) (Table 3).

In females, a moderate and positive association was found between cognitive function and motor-motor dual task performance ($r= 0.328$, $p= 0.036$) and a moderate and negative association was found between cognitive motor dual task ($r=-0.383$, $p=0.013$). A moderate statistically significant difference was found between motor function and cognitive-motor dual task ($r=0.427$, $p=0.005$) and cognitive-motor dual task performance ($r=-0.692$, $p=0.0001$) (Table 4).

In males, a moderate and negative association was found between cognitive function and cognitive motor dual task duration ($r=-0.312$, $p=0.047$) and cognitive-motor dual task performance ($r=-0.420$, $p=0.006$). While a moderate and positive association was found between motor function and motor-motor dual task duration ($r=0.473$, $p=0.002$), a moderate and negative association was found between motor function and cognitive-motor dual task performance ($r=-0.369$, $p=0.018$) (Table 4).

Discussion

The present study has investigated the gender differences with regard to dual task performance and the influences of cognitive and motor tasks on dual tasks in community dwelling healthy older adults. In the study, females were found to complete motor-motor and cognitive-motor dual tasks in a shorter time than males. On the other hand, males were found to achieve cognitive-motor dual task performances better. In females, cognitive function was found to be related with motor-motor dual task performance and cognitive-motor dual task duration. A relationship was detected between motor function and motor-motor dual task duration and performance, and between cognitive-motor dual task duration and performance. In males, cognitive function was found to be related with cognitive-motor dual task duration and performance. A relationship was detected between motor function and motor-motor dual task duration and cognitive-motor dual task performance.

The systemic changes occurring with aging make daily living activities difficult. When a second task is added to daily living activities, imbalance and falls may occur. In a study evaluating the older adults with or without falls, walking speed was found to decrease when a second motor task is added (Toulotte et al., 2006). In another study, adding a cognitive function while walking was concluded to decrease walking speed (Beauchet et al., 2005). In accordance with the literature data and the result of our study, motor and cognitive tasks added during walk were shown to decrease walking speed both in males and females.

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Table 3. Comparison of completion time and performance in dual tasks

Variables	Female (n=41) Mean±SD	Male (n=41) Mean±SD	t	*p*-value
Motor-Motor Dual Task Completion Time (sec)	10.71±1.86	11.82±1.10	-3.29	**0.001***
Motor-Motor Dual Task Performance	10.82±9.41	12.62±6.53	-1.00	0.319
Cognitive-Motor Dual Task Completion Time (sec)	12.73±1.06	13.02±1.07	-1.24	0.217
Cognitive-Motor Dual Task Performance	29.50±13.77	24.19±8.43	2.10	**0.038***

t: Independent Samples t Test, SD: Standard deviation, sec: second, Significance level: p<0.05.

Table 4. Relationships between parameters according to genders

Variables	Female (n=41)		Male (n=41)	
	r	*p*-value	r	*p*-value
Montreal Cognitive Assessment - Motor-Motor Dual Task Completion Time	0.013	0.936	-0.005	0.977
Montreal Cognitive Assessment - Motor-Motor Dual Task Performance	0.328	**0.036***	-0.082	0.608
Montreal Cognitive Assessment - Cognitive-Motor Dual Task Completion Time	-0.383	**0.013***	-0.312	**0.047***
Montreal Cognitive Assessment - Cognitive-Motor Dual Task Performance	0.106	0.508	-0.420	**0.006***
10-meter walk test - Motor-Motor Dual Task Completion Time	0.450	**0.003***	0.473	**0.002***
10-meter walk test - Motor-Motor Dual Task Performance	-0.509	**0.001***	0.055	0.732
10-meter walk test - Cognitive-Motor Dual Task Completion Time	0.427	**0.005***	0.170	0.289
10-meter walk test - Cognitive-Motor Dual Task Performance	-0.692	**0.0001***	-0.369	**0.018***

r: Pearson correlation coefficient, Significance level: p<0.05.

Many studies are available in the literature investigating dual task performances in community dwelling older adults (Dubost et al., 2006; Swanenburg et al., 2008; Verhaeghen et al., 2003), however there are a few studies investigating gender differences in dual task performances (Hollman et al., 2011).

Most falls occur during walk and falls-related deaths are more common among males than females. Many studies have shown that the decreased walking speed during normal and dual tasks is a risk factor for falls (Hollman et al., 2011; Kressig et al., 2008). Callisaya et al. (2008) showed that walking speed, stride length and cadence decreased similarly with age in males and females. The results of our study have revealed that females completed motor-motor and cognitive-motor tasks in a shorter time than males. However, males were found to have better cognitive-motor task performances than females.

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Gender differences in dual task performance could not be fully explained yet. However, some physiologic studies may contribute to interpret these differences. While unilateral activation occurs in cerebral hemispheres in males during dual task experiences, bilateral activation occurs in females (McGlone, 1980). While global, regional and asymmetrical neuron losses develop together with aging, the bilateral activation in females may be an advantage (Hollman et al., 2011). However, the gray matter in putamen decreases faster in males with aging (Hollman et al., 2011; Wellman, 2012). In our study, the longer completion time of motor-motor and cognitive-motor tasks in males may be explained with the fact that putamen is responsible for balance, verbal memory and walking control and losses occur in these regions with aging.

The strength of our study is evaluating the relationship between cognitive and motor functions, and dual task performances according to gender. The limitations of our study include not evaluating walking parameters during dual task according to gender in detail and not evaluating balance and falls risks. Future studies are required to investigate various dual tasks during walk and falls risks according to gender.

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